



Consumption of fruit and vegetables and associated factors among 11- to 13- year-old children in Portugal

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Master Thesis

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Forewords

This thesis consists of two parts, the master thesis and a paper. The paper, included in Appendix 1, should be considered as the main part. The paper will be submitted to a peer-reviewed journal. In the master thesis, additional information is included. The results are only presented in the article with a short summary in the result section of the master thesis.

Summary

Background

A high intake of fruit and vegetables is important as an essential part of a healthy lifestyle. Although differences in fruit and vegetable intake have been observed between the European countries, large proportions of the population, including children and adolescents, have a low consumption compared with the recommendations. It is important to promote a high intake of fruit and vegetables in childhood as dietary habits acquired in early life may have a great impact on long-term health status. In order to increase the intake of fruit and vegetables among children, insight into important and changeable correlates of fruit and vegetable consumption is needed. The Pro Children cross-sectional survey was designed to gather information about the actual consumption and potential correlates of fruit and vegetable consumption among 11- to 13-year-old children and their parents in the participating European countries. The aim of this study was to assess the intake of fruit and vegetables among Portuguese children and their mothers. The proportion of children reporting positively to personal, social and physical environmental factors regarding fruit and vegetable consumption, together with assessment of potential correlates of daily fruit and vegetable intake were also studied. Focus was made on gender and regional differences (Norte, Centro, Lisboa e vale de Tejo, Alentejo and Algarve) in the consumption and the associated factors within Portugal.

Method

For this thesis data from the Pro Children cross-sectional study in Portugal was used. Portugal had the largest sample size of the nine participating countries with 2535 eligible students from 27 schools and their respective parents. A precoded self-administered questionnaire was developed to assess fruit and vegetable intake as well as possible factors associated with these consumption patterns among children, as well as among one of their parents. Fruit and vegetable intake was assessed with a 24-hour recall and food frequency questions. The potential correlates included were divided into demographic, personal, perceived social environmental and perceived physical-environmental factors, and were assessed with separate questions. Data from 2134 children and 1314 mothers were included in the analyses.

Results

The consumption of fruit and vegetables was low among the children, both amount (mean fruit intake = 153 grams and mean vegetables intake = 111 grams) and frequency of intake (daily fruit intake = 56.5% and daily vegetable intake = 50.1%). Both gender and regional differences were found. Girls had a more frequent consumption of both fruit and vegetables compared with boys, and Lisboa and Algarve were the two regions where children reported the lowest consumption of fruit and vegetables respectively. The proportion of children consuming 400 grams per day, as recommended by WHO, the day prior to the survey was only 21.4%. The consumption of fruit and vegetables was also low among the mothers, and only 44.0% of the mothers reported to reach the WHO recommendations. Children were in general positive towards factors regarding fruit and vegetable intake. Gender and regional differences were found, with more girls reporting positively to the personal and social environmental factors regarding fruit and vegetables compared with boys. In addition, nearly all children perceived the fruit and vegetable availability at home to be good. The personal factors, i.e. knowledge, liking and preferences, were found to be significantly associated with daily intake of fruit and vegetables, as well as two social environmental factors: modelling and demand family rule. In addition, mothers' intake of fruit was associated with daily fruit intake among their offspring. Gender and regional differences were also found for the factors associated with daily fruit and vegetable intake.

Conclusion

The fruit and vegetable intake among Portuguese children as well as their mothers, although high in the European setting, is low compared with the recommendations. However children are positive towards factors regarding fruit and vegetable consumption. Gender and regional differences were found both for consumption of fruit and vegetables, and for the associated factors. It is important to increase the consumption, especially of vegetables, and personal and social environmental factors together with mothers' intake were found to be important correlates.

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1. Introduction

1.1 Consumption of fruit and vegetables

The importance of a high fruit and vegetable intake as an essential part of a healthy lifestyle has received an increasing amount of attention during the last decade (1). The benefits of a adequate intake of fruit and vegetables are observed in a wide range of epidemiological studies (1-9). It is well known that an adequate intake of fruit and vegetables promotes health as it is important in the prevention of non-communicable diseases like cardiovascular disease, obesity and cancer, which today are large public health problems (1).

There are large differences in fruit and vegetable intake between and within the European countries (10-13). Although the economic development and the increased purchasing power have lead to a situation where the availability of fruit and vegetables is more equal, culture and lifestyle patterns are still kept alive and affect the food choices leading to differences in intake (14). According to FAO's food balance sheets data (15) and some dietary studies (16-19) there exists a "North-South gradient" in fruit and vegetable consumption between the European countries, with the highest intake in the south and a lower intake in the north and east. This gradient is gradually fading as the southern countries are rapidly changing their dietary pattern towards a lower consumption while it has been observed an increase in the fruit and vegetable intake in the northern countries (20).

Studies show that the fruit and vegetable intake are highest in the higher socioeconomic groups (21;22), and that this is mainly due to the higher educational level seen in this group (23;24). Roos et al. (25) suggest that education level is more important in the northern and western European countries. In the northern countries where many perceive fruit and vegetables as "modern food", and a symbol of healthy diets, the highest intake of fruit and vegetables is observed in the higher socioeconomic groups. However in the southern countries, the fruit and vegetable consumption is often associated with traditional dietary habits, and the lower socioeconomic groups may have a higher intake due to better access to cheap vegetables and fruits, self cultivating and obtaining them through unofficial channels such as neighbours or friends. Regional differences in fruit and vegetable consumption

within the European countries have been assessed in the Data Food Networking (DAFNE) project. The results are not always comparable between countries, but urban areas tend to have a higher fruit consumption than rural areas (26).

1.2 Recommendations for fruit and vegetable intake

Most European countries, as well as international health agencies, have developed recommendations for the desirable level of consumption of fruit and vegetables. The recommendations vary between 400 and 750 grams per day (27), and specific guidelines for children exist in some of the countries (28). The WHO recommends that the individuals should increase the consumption of fruit and vegetables and aims for a population goal for fruit and vegetable consumption equal to or above 400 grams per day. This recommended amount of 400 grams is considered as a population average and is important for the maintenance of health (1). Studies show that a large proportion of the European population, including children and adolescents, has a low consumption of fruit and vegetables compared to these recommendations (29-34).

1.3 Children

1.3.1 Importance of fruit and vegetable intake in children

Promoting fruit and vegetable intake among children is an important health-related policy objective (1). Childhood and adolescence is a time when the physiological need for nutrients is high and a diet of high nutritional quality is important. Fruit and vegetables contain important micronutrients and therefore increasing fruit and vegetable consumption should improve the quality of children's diet. It is also important to promote a high intake of fruit and vegetable in childhood since healthy food habits acquired early in life might track into adolescence and adulthood (35-38) and therefore it may have a great impact on long-term health status. At the same time children are still at an age when food preferences and habits can be modified (39).

1.3.2 Consumption of fruit and vegetables among children

In the past few years an increasing number of European studies of fruit and vegetables consumption among children have been conducted. The Pro Children cross-sectional survey (CSS) was designed to gather information about the actual consumption of fruit and vegetables and correlates of fruit and vegetables intake among 11- to 13-year-old children and their parents in the participating European countries. The Pro Children CSS showed that 11- to 13-year old European children have a low consumption of fruit and vegetables (40). Large differences in consumption could be observed between the participating countries, however the intake was low in all countries (41). Data from the Health Behaviour in School-aged Children (HBSC) Study 2001/2002 (34) supported these large variations in fruit and vegetable consumption between the countries, and the countries showed a similar ranking as the Pro Children countries regarding intake. In addition, the HBSC study showed that the fruit intake has decreased during recent years in two thirds of the 29 participating countries with available information for trend comparisons (34). Other studies support a low intake of fruit and vegetables among children (42;43). Moreover, the consumption patterns seem to decrease with increasing age (34), however an earlier study showed that the consumption was stable with respect to the relative intake between individuals (44).

1.3.3 Correlates of fruit and vegetables intake among children

In order to increase the intake of fruit and vegetables among children, insight into important and changeable correlates of fruit and vegetable consumption is needed. In the past few years several studies have also assessed possible correlates of fruit and vegetable intake among children. A recently comprehensive review (22) including 98 papers, found that gender, age, socio-economic position, preferences, parental intake and home availability/accessibility are the strongest determinants of fruit and vegetable intake. Another recent review (45) concluded that availability/accessibility and taste preferences were the most important determinants for fruit and vegetable intake among 6- to 12- year-old children. The Pro Children project showed that both personal, social-environmental and physical-environmental factors are important for fruit and vegetable consumption among 11- to 13- year old European children (34;46-48). Differences between the participating countries were found especially for factors regarding vegetable intake. A more consistent pattern was found for factors regarding fruit intake (49). For the social environmental

factors, the between country differences were larger than for the personal factors. A north-south gradient could be seen for the social environmental factors for fruit, as a higher percentage of children in the southern European countries reported positively towards positive role model behaviour, active parental encouragement and parental demand. This was not observed for vegetables, which may be explained by cultural differences (50).

Children develop eating habits and food preferences as they grow and are exposed to a variety of food items, textures, taste and flavours, and therefore Birch et al. (51) recommend to let the children taste and get familiar with a high variety of foods and tastes at an early age. Reported exposure or tasting of foods may also lead to increased liking for foods that originally were not appreciated (52;53). A high availability and accessibility of fruit and vegetables at home is also important as it has shown to increase the acceptance for these foods and thereby also the intake (54). Food preferences are strongly associated with food selection and food acceptance among children (39;55;56) and Birch et al. (39) further suggest that more knowledge about how preferences are developed may promote healthy eating habits and may be a way to understand how to make children learn to like other foods.

Parents' importance in the development of healthy eating habits and food preferences among children is unquestionable as they shape the children's eating environment in a variety of ways (57-59). The school environment with teachers, peers and school children/friends, together with media, become more important with age and as the children grow up they turn more independent and start to make their own food choices (60). Parental fruit and vegetable consumption are seen as one of the key factors for fruit and vegetable consumption among children although the mechanism remains unclear (61-64). An explanation is the genetic similarities, but also parents who enjoy eating fruit and vegetables are good peer models and they increase the child's exposure towards fruit and vegetables as they make more fruit and vegetables available/accessible at home (65). Birch et al. (66) support that parental food selection and eating behaviour will affect the child's preferences and thereby the intake. As the society changes and fewer meals are eaten together at home, the role of the parents as role models for healthy eating is decreasing (67). Studies have shown that the trend of eating outside home, which implies a higher consumption of fast food, decreases the intake of fruit and vegetables (68). Various other studies (69-73) also support this, as they report that those eating more often with the family tend to eat more fruit and vegetables than those doing so less frequently.

Parental style has often been discussed when looking at how to pass on good food habits to children, but high levels of parental control has showed negative associations with fruit and vegetables intake (74-77). Reward is a commonly used strategy to increase the intake of specific foods among children, but the results show that this strategy may further increase the dislike of the food. At the same time the preference for the food given as reward is found to be enhanced (39). Encouraging the child to eat a specific food may be effective, but only when it is combined with a positive attitude among the parents (78). When encouragement leads to demand of food intake or pressure to eat among children it is suggested to have a negative outcome (79;80). Birch et al. (81) found that pressure to eat and restriction of food also lead to lower intakes of fruit and vegetables in children. In addition, restricting physical access may enhance liking for the restricted food (82). The emotional atmosphere around a meal is also very important and a positive atmosphere leads to a higher preference and thereby greater food consumption (83-85).

1.4 Portugal

The Portuguese case is of particular interest because the results from the Pro Children CSS show that both the children and their mothers report one of the most frequent and highest measured intakes of fruit and vegetables among the nine participating countries (86-88). At the same time, Portugal also contributes with the largest sample which makes the data very useful for comparing variables at the national level. Separate analyzes of Pro Children CSS data have been published from a country with traditionally low consumption levels of fruit and vegetables; i.e. Iceland (89), and from Belgium and the Netherlands (90). However data from southern European countries with traditionally higher fruit and vegetable intakes have not been studied. Based on the existing information about Portugal it is possible to study the distribution of intake of fruit and vegetables between different regions.

1.4.1 Food consumption pattern in Portugal

The traditional diet in Portugal, as in other Southern European countries, has a high content of fruit and vegetables and is often referred to as the “Mediterranean diet” (91). Presently Portugal has no updated data on the dietary habits of the general population as the only Portuguese national dietary survey was held back 1980. Even so, socio-demographic and

economic changes together with differences in food availability, may indicate that the Portuguese have acquired different dietary habits, and households in urban areas and those with higher education are the ones changing more rapidly (92). The intake of fruit and vegetables in Portugal is still relatively high when compared to other European countries. Although the mean availability of fruit and vegetables decreased from 1990 to 2000, this decrease was not as dramatic in percentages when compared to the neighbouring country, Spain. The trend now seems to have reversed for the availability of fruit which increased from 1995 to 2000 (26).

Data shows that there are significant differences in the consumption pattern of fruit and vegetables within Portugal (26;93;94). Moreira et al. (95) demonstrated that higher education lead to increased intake of vegetable soup, vegetables and fruit. The data from the DAFNE project also shows that the mean availability of fruit increases with education, whereas the availability of vegetables decreases with education (26). When it comes to differences within Portugal, earlier studies have only looked at differences between urban-rural areas (26;96). One study indicates that households in urban areas had a higher availability of fruit, while rural areas had the highest availability of vegetables (97). These results are not surprising taking into consideration that the urban areas have the highest percentage of individuals with higher education. The DAFNE data from 2000 also shows the same urban-rural trend for fruit, but not for vegetables (26).

Portugal has limited data on the consumption of fruit and vegetables among children. Results from the other European countries participating in the Pro Children CSS showed that Portuguese children report one of the highest intakes, both with respect to portions and frequencies. The mean intake of fruit and vegetables respectively were 141 grams and 86 grams for the total Pro Children sample (i.e. across all nine countries) compared to 153 grams and 111 grams for the Portuguese children (98).

The HBSC study from 2001/2002 (34), conducted among schoolchildren in 35 countries and regions in Europe and America, also revealed that for 11-year old children, Portugal has the highest percentage of children consuming fruit every day. The study also shows that when it comes to vegetables, Portuguese 11-year-old children have only a median consumption. That same study showed that the percentage of Portuguese children who eat fruit and vegetables

every day decreases from the age of 11-year to 13-years, and that girls in general have a higher intake than boys.

1.5 Aims

The aim of this study is to assess the intake of fruit and vegetables among Portuguese children and their mothers, and the potential personal, social and physical environmental factors associated with daily fruit and vegetable intake among the children. Specifically gender differences and regional differences (Norte, Centro, Lisboa e vale de Tejo (Lisboa), Alentejo and Algarve) in the consumption pattern and in the associated factors are investigated.

The research questions will be divided in:

1. Intake of fruit and vegetables
 - What is the intake of fruit and vegetables in Portuguese children? Are there gender differences and differences between the regions?
 - What proportion of the children reach the WHO recommendations of 400 grams per day? Are there gender differences and differences between the regions?
 - What is the intake of fruit and vegetables in Portuguese mothers? Are there differences between the regions?
 - What proportion of the mothers reach the WHO recommendations of 400 grams per day? Are there differences between the regions?
2. Factors associated with fruit and vegetable intake.
 - Describe the proportion of children reporting positively to the different factors regarding fruit and vegetable consumption. What proportion of children report positive attitude towards the personal factors, i.e. knowledge, liking and preferences, the social environmental factors, i.e. modelling, active parental encouragement, demand family rule and parental facilitation, and the physical environmental factor, availability at home. Are there gender or regional differences?

-
- Which factors (i.e. demographic, personal, social environmental, physical environmental, mother's frequency of intake) are correlates of daily fruit and vegetable intake? Are there gender or regional differences?

2. Method

2.1 The Pro Children project

For this study data from the Pro Children CSS in Portugal is used. The Pro Children CSS is part of the Pro Children project which is a European project designed to:

- 1) Provide information on actual consumption level of fruit and vegetables in European schoolchildren and their parents;
- 2) Understand the determinants of consumption patterns among the children;
- 3) Develop and test effective strategies to promote adequate consumption levels of fruit and vegetables among schoolchildren.

The project consisted of two phases: phase one had the objective to assess vegetable and fruit consumption and determinants of consumption levels. This phase was carried out in all nine participating countries - Austria, Belgium, Denmark, Iceland, the Netherlands, Norway, Portugal, Spain and Sweden. Phase two had the objective to develop, implement and evaluated the planned interventions in group-randomized field studies. This phase was only carried out in three of the participating countries - Spain, the Netherlands and Norway (99). In each country participating in the Pro Children study, schools were chosen as the sampling unit, and from each country samples of at least 20 schools and 1300 eligible children were included. This student sample size was regarded as sufficient to allow for the within-country comparisons (gender, socio-economic status and urban-rural differences) and taking the cluster sample into account (100). A total of 15 404 students and an equal number of parents was chosen to participated in the survey. The response rate was high, 13 924 children (90.4%) (101) and 11 727 parents (76.1%) handed in the questionnaires (102). Gender distribution was fairly equal for all countries.

Written consents from the parents were obtained before including the children in the cross-sectional survey. In addition, research clearance was obtained from research ethics committees in all countries where this was required for this kind of non-invasive study (103). In Portugal, the schools and the parents had to allow the children's participation. The

completion of the questionnaire was voluntary and parents could demand that their child's questionnaire should be destroyed. No other ethical approval was needed. The survey was conducted anonymously in all countries, and the only identification was an identical code number, which made the linking of child-parents questionnaires possible. The Pro Children project adheres to the Helsinki Declaration and the convention of the Council of Europe on human rights and biomedicine (104).

2.2 Study sample

Portugal had the largest sample size of the nine participating countries with 2535 eligible students from 27 schools and their respective parents. The response rate was also the highest in this country with 2494 children (98.4%) and 2114 parents (83.4%) participating (105), which allows assessing differences in intake and correlates of intake within this country. Due to lack of inconsistent answers or to lack of parental written consent 360 questionnaires were excluded for children and 454 for parents. Portuguese data was entered for 2134 children and 1660 parents, of which 79.2% were mothers (106;107).

2.3 The Instrument

For the Pro Children project, a theoretical framework (<http://www.prochildren.org>), which guided both the development of the research instrument and the intervention, was developed using different behavioural theories (Social cognitive theory (108) the “attitude, social influence, self-efficacy model” (109;110) the theory of triadic influence (111) and a social-ecological perspective on health behaviour (112). This was done to ensure the inclusion of potential determinants at the individual, social and environmental level. This framework proposes that determinants of fruit and vegetable consumption can be found in the cultural, the physical and the social environment, and that they in turn influence the more proximal factors to be found at the personal level (113). A precoded self-administered questionnaire was further developed (The questionnaire, in Norwegian, is included in Appendix 3. For other languages see: <http://www.prochildren.org>) to assess fruit and vegetable intake as well as possible factors associated with these consumption patterns among children, as well as among one of their parents.

Both instruments were originally developed in English before translated into national languages. Persons fluent in both the national language and English, but not involved in the development of the instrument, compared the questionnaire to the originally one and translated it back again (114).

2.3.1 Intake of fruit and vegetables

Fruit and vegetable intake were assessed in a similar way for both the children and the parents, using a precoded 24-hour recall and food frequency questions.

The 24-hour recall

The 24-hour recall was used to assess yesterday's fruit and vegetable intake and was divided into three time intervals including several eating occasions. In the children's questionnaire: (i) morning, before school, (ii) at school/School time and during lunch, (iii) afternoon, supper and after supper. In the adult's questionnaire: (i) morning/midmorning, (ii) lunch/afternoon, (iii) dinner/late in the evening. The reported amount of fruit and vegetables consumed was recoded into standardized portion size (in grams). This 24-hour recall part was used for measuring group mean intake and for specifying the type of fruit and vegetables consumed (115;116).

Food frequency

The usual daily consumption of fruit and vegetables was measured with food frequency questions (FFQ). Frequency of fruit intake was assessed by one question asking "How often do you usually eat fresh fruit?". Frequency of vegetable intake was assessed by three questions asking "How often do you usual eat salad/grated vegetables, raw vegetables and cooked vegetables?". In addition a question about intake of potatoes was included to avoid that the respondent included potato consumption in the cooked vegetable intake. The answer categories for these frequency questions were assessed on an eight-point scale ranging from "never" (= 0) to "every day, more than twice a day" (= 7). This food frequency part was used to rank subjects according to their usual intake (117;118).

2.3.2 Correlates of intake

The possible correlates of children's fruit and vegetable intake that were included in the children's questionnaire were divided into demographic, personal, perceived social environmental and perceived physical environmental factors. In addition parental intake of fruit and vegetables, as reported by the parents, was also regarded as possible correlate of their child's intake. *Demographic* factors included in this analyses are gender (girl = 0, boy = 1), age (measured in years and months), region (which region they lived in). In addition to those demographic factors, parental education level was measured in the parents' questionnaire based on the number of years of education completed, with four response categories, ranging from less than 7 years (= 1), 7-9 years (= 2), 10-12 years (= 3), 12 years and more (= 4). The *personal* factors included in the analyses are: knowledge of daily recommended intake levels, general liking of fruit and vegetables and preferences for 12 different kinds of fruit and vegetables. Knowledge was measured asking "How much fruit/vegetables do you think you should eat to have a healthy diet?", liking was measured asking to which degree the respondent agrees with the statements "I like to eat fruit/vegetables every day" and "Fruit/vegetables tastes good". Preferences for fruit and vegetables was measured asking "Which of the following fruits/vegetables do you like or dislike" on a list of 12 different kinds of fruits and 12 different kinds of vegetables. The perceived *social environmental* factors included in the analyses are: modelling, active parental encouragement, demand family rule and parental facilitation. Modelling was measured asking to which degree the respondent agrees with the statements "My mother/father/best friend eats fruit/vegetables every day", active parental encouragement was measured asking "My mother/father encourages me to eat fruit/vegetables every day", demand family rule was measured asking "Do your parents demand that you eat fruit/vegetables every day?", and parental facilitation was measured asking "Does your mother or father usually cut up fruit/vegetables for you in between meals?". Availability of fruit and vegetables at home was included as a perceived *physical environmental* factor. This was measured by three questions: "If you tell at home which fruits/vegetables you would like to eat, will they be bought?", "Are there usually different kind of fruit/vegetables available at home?" and "Is there usually fruit/vegetables available at home that you like?".

All factors, except knowledge, were assessed using a bipolar five-point scale, ranging from never/I fully disagree/dislike very much (= -2) to yes, always/I fully agree/like very much (=

2). “Knowledge of recommended intake levels” was assessed on an eight-point scale that ranged from no fruit/vegetables (= 0) to 5 pieces or portions per day or more (= 7) (119;120).

2.3.3 Reliability and validity of the questionnaires

The questionnaire for children was finally tested for reliability and validity in multiple pilot tests among 10- to 11-year-old children (121;122). Based on this formal testing of the child instruments to assess fruit and vegetable intake among children in Belgium, Denmark, Iceland, Norway, Portugal and Spain, it was concluded that the questionnaire instrument was valid and reliable in giving national group means of fruit and vegetable intake among children as well as ranking them by usual intake. For validity, correlations were high between intake from the FFQ and the 7-day food record except for fruit juice. The correlations between the 24-hour recall and the food record showed a tendency to higher mean intakes measured with the 24-hour recall. Therefore the 24-hour recall was modified before use. The validity of this adapted 24-hour recall was not tested, but the reproducibility was good. The reproducibility showed in general high correlates between intake (FFQ) filled in at time 1 (test) and time 2 (retest) for all the six countries, and the correlates ranged between 0.47 and 0.77 for fruit and 0.59 and 0.74 for vegetables (123). The reliability and predictive validity of the instrument to assess the possible correlates of fruit and vegetable intake in the children’s questionnaire were also tested. The internal consistency of the scales was moderate to good, ranging from 0.57 to 0.83 for fruit and 0.65-0.89 for vegetables (124). The test-retest reliability for possible correlates of fruit and vegetable intake was good to very good for most of the correlates, ranging from 0.60 to 0.74 for fruits and 0.57-0.82 for vegetables (125). Predictive validity was found to be moderate to good for the personal factors, but lower for the perceived social environmental and perceived physical environmental factors. The questionnaire was considered to be a reliable and valid tool for assessing personal, social and environmental factors for fruit and vegetables intake among 10- to 11-year-old children (126).

Validity of parental intake of fruit and vegetables has also been tested prior to data collection among 36 adults in Iceland. This study indicated that the mean intake estimated from the 24-hour recall did not differ from the 1-day weighed food record and the mean intake estimated from the FFQ did not differ from the 7-day food record. Therefore it was concluded that the

24-hour recall gave valid intake data on group mean level for both fruit and vegetables and the FFQ was suitable for ranking individuals according to fruit and vegetables intake. The two parts, 24-hour recall and FFQ, complemented each other and the instrument was found valid for assessing fruit and vegetable intake among adults with low intake (127).

2.4 Data collection procedures

The collection of data among children was carried out during one school session in the classroom under the supervision of the classroom teacher who had received instructions from the research centre. In addition, all the participating children received a closed envelop with a questionnaire to take home to be filled in by one of the parents. This questionnaire was again returned by the children to the classroom teacher after completing by one of the parents (128). Parents themselves could decide which parent completed the survey. This led to a gender related selection bias as the questionnaire was primarily filled out by the parent traditionally responsible for the child's care, i.e. the mother. Because of this low response rate of fathers only data from the mothers are used in this thesis.

2.5 Data treatment and analyses

A standardized protocol was developed for all data processing. This allowed the entering, cleaning and checking of data to be done at the national centres. The data processing and quality control of all the data took place at the joint Data Management Centre at the University of Vienna.

The 24-hour recall and the FFQ

The consumption of fruit in grams was calculated from the 24-hour recall. Information from the three time intervals was summarized. Total intake of vegetables was calculated by summing intake of soup vegetables, salad, raw vegetables and cooked vegetables. Intake of fruit and total vegetables were used separately for the analyses, while the total fruit and vegetable intake was calculated to assess the percentage of respondents reaching the WHO recommendation.

The percentage of children consuming fruit and vegetables daily were calculated from the FFQ. Frequency of total vegetable intake was calculated summarizing the frequency of intake of salad, raw vegetables and cooked vegetables. The results from the FFQ were dichotomized into no daily intake (= 0) and daily intake (= 1) of fruit and vegetables respectively.

Due to not completing the dietary part of the questionnaire or due to over reporting of intake in grams (> 1000g of fruit and vegetables per day for the 24-hour recall) or number of portions (according to the standardized protocol a maximal number of portions per meal was set), data from 16 children and 29 mothers were excluded. The final number included in the dietary analyses was therefore 2118 children and 1285 mothers.

The demographic correlates

The variable gender (girl = 0, boy = 1) was maintained while age was dichotomised into 11 years = 0 and > 11 years = 1, region was coded as Norte = 1, Centro = 2, Lisboa = 3, Alentejo = 4, Algarve = 5 and mothers' education was dichotomised into < 10 years = 1 and ≥ 10 years = 2.

The personal, perceived social-environmental and perceived physical-environmental factors

Initially all variables were recoded in the same direction, so that higher score implied more agreement with the statement. A scale was computed when more than half of the items for a specific factor were answered. Therefore the number of cases in each analysis varies with the number of children responding. For this study we again assessed the internal consistency of the scales. The Cronbach's alpha values ranged from 0.52-0.80 for fruit and 0.73-0.89 for vegetables indicating similar or better reliability than in the reliability study (129).

To present the proportion of children reporting positively to the different factors regarding fruit and vegetable intake, the score for each scale was dichotomized. The value +0.5 was used as a cut-off point for a positive construct-value to distinguish it from a negative or a neutral value. All values from -2 to 0.49 were given the value 0 (negative or neutral) and all values from 0.5 to 2 were given the value 1 (positive).

2.5.2 Statistical analyses

The programme software SPSS (Statistical package for Social Science) version 14.0 was used for all analyses. All p-values are two-sided and 5% level of significance was used.

Since fruit and vegetables are multidetermined behaviours and determinants of fruit intake may differ from determinants for vegetables intake, analysis are done separately for correlates regarding fruit and for vegetable intake (89).

Portugal is divided in five geographical regions: Norte, Centro, Lisboa, Alentejo and Algarve (See Appendix 2), and for this study those five regions are used.

Firstly, descriptive statistics were conducted for the total sample and for the five regions to assess distribution of age, gender, region, mother's education level, children and mothers' intake of fruit and vegetables (in grams and frequency) and proportions of children reporting positively to the factors regarding fruit and vegetables consumption (in % and 95% CI). In addition, the proportion of children and mothers consuming 400 grams of fruit and vegetables were calculated.

Secondly, differences in intake of fruit and vegetables were assessed using both the 24-hour recall and the FFQ. The data from the 24-hour recall were mostly skewed and therefore non-parametric statistic methods were considered to be more appropriate. For testing of differences between regions and gender the Kruskal-Wallis Test and Mann-Whitney U Test were used. The sample mean, 95% CI, median, 25th and 75th percentiles are the statistics presented. Differences in daily intake between regions and genders were tested with Chi-square for independence and the percentage of children consuming fruit and vegetable daily are presented. The analyses of intake were done both for children and for mothers.

Thirdly, differences in the proportion of children in each region responding positively to the factors regarding fruit and vegetable consumption were analysed using the Chi-square for independence. Differences between genders in the total sample were also tested with the same non-parametric test.

Finally, logistic regression were run to assess possible correlates (demographic factors, personal factors, perceived social environmental factors, perceived physical environmental factors and mothers' frequency of intake) of children's daily fruit and vegetable intake. First

the logistic regression was run including only variables from the children questionnaire to maintain a large sample ($n = 2118$) and statistical power. In a second model mothers' educational level and the mothers' daily intake were included. The odds ratio and the 95% CI of the odds ratio are reported for the total sample, both genders, and all five regions separately. Only significantly results are reported.

3. Summary of results

Results from both the 24-hour recall and the FFQ questionnaire, in addition to the assessment of the importance of the different factors regarding fruit and vegetable consumption are presented in the article (See Appendix 1). Only results from both genders and the five regions are presented from the proportions of children reporting positively regarding fruit and vegetable consumption and from the correlates of daily fruit and vegetable intake, since results from the total Portuguese sample have been published previously.

3.1 Article

The consumption of fruit and vegetables was low among the children, both amount (mean fruit intake = 153 grams and mean vegetables intake = 111 grams) and frequency of intake (daily fruit intake = 56.5% and daily vegetable intake = 50.1%). Both gender and regional differences were found. Girls had a more frequent consumption of both fruit and vegetables compared with boys, and Lisboa and Algarve were the two regions where children reported the lowest consumption of fruit and vegetables respectively. The proportion of children consuming 400 grams per day, as recommended by WHO, the day prior to the survey was only 21.4%. The consumption of fruit and vegetables was also low among the mothers, and only 44.0% of the mothers reported to reach the WHO recommendations. Regional differences among the mothers were only found for vegetables consumption. Children were in general positive towards factors regarding fruit and vegetable intake. Gender and regional differences were found, with more girls reporting positively to the personal and social environmental factors regarding fruit compared with boys. In addition, nearly all children perceived the fruit and vegetable availability at home to be good. The personal factors, i.e. knowledge, liking and preferences, were found to be significantly associated with daily intake of fruit and vegetables, as well as two social-environmental factors: modelling and demand family rule. In addition, mothers' intake of fruit was associated with daily fruit intake among their offspring. Gender and regional differences were also found for the factors associated with daily fruit and vegetable intake.

4. Discussion

The objective of this thesis was to study fruit and vegetable consumption and its related factors among 11- to 13-year-old children in Portugal. In particular, we set out to investigate potential gender and regional differences within Portugal. The aims were divided in twofold assessment; first, to assess intake of fruit and vegetables, both in grams and frequency, among the children and their mothers; second, to assess the potential personal, social and physical environmental correlates of daily fruit and vegetable intake among the participating children. In addition, the importance of mother's frequency of intake and mother's education level was assessed.

4.1 The main findings

4.1.1 Low consumption of fruit and vegetables

The results show that Portuguese children have a low intake of fruit and vegetables as compared to the international (1) and national (130) recommendations. The intake of vegetables was particularly low. About half of the children reported to consume fruit and vegetables daily. Girls reported a more frequent consumption of both fruit and vegetables than boys. Although regional differences were found with respect to both fruit and vegetable intake in grams and frequency, the reported consumption was low in all five regions. The mothers also reported relatively low consumption of fruit and vegetables, measured both in portions and frequency, compared to excising recommendations. For the mothers, regional differences in reported intake were only seen for vegetable consumption.

Data from Portuguese children is scarce, therefore narrowing the possibility of comparing the results. When comparing the observed results to those observed in the other eight European countries participating in the CSS of the Pro children project, Portugal was found to be one of the countries where children had the highest consumption patterns of both fruit and vegetables (131). The HBSC study also seems to confirm that Portuguese children have a high consumption of fruit, but only a moderate consumption of vegetables when compared to children in other European countries. The proportions of Portuguese children who

reported to have a daily fruit and vegetables intake from the 2001/2002 survey were similar with the results for fruit, but much lower for vegetables compared with the results from the Pro Children CSS (34). Both studies show that even though the intake and frequency of intake of fruit and vegetables among Portuguese children is high in the European setting, it is low compared with the recommendations.

4.1.2 The correlates

A high proportion of the children report positively to factors regarding fruit and vegetable intake

Portuguese children appear to have a positive attitude towards fruit and vegetable consumption as a high proportion of the children reported positively to the different factors regarding fruit and vegetable consumption. In general, more girls reported positively towards the different factors compared with boys. However, few significant gender differences were found for factors regarding vegetable consumption. Regional differences were found, especially for the social environmental factors.

Results from a similar study assessing the proportion of children reporting positively to factors regarding fruit and vegetable consumption in all nine Pro Children countries, show that Portugal is among the countries with the highest proportion of children reporting positively to factors regarding fruit consumption. For the factors regarding vegetable consumption, Portuguese children are in general more positive as compared to the other eight countries, but the differences are smaller and does not apply to all factors (132).

Many factors are associated with daily intake of fruit and vegetables

This study shows that personal and social environmental factors are important correlates of daily fruit and vegetable intake for Portuguese children. In addition, daily vegetable intake was less likely to be reported by boys. Mothers' intake of fruit was associated with their children's daily intake of fruit, but the association between the mothers' and the children's daily intake of vegetables was weaker. Mothers' education level was only associated with daily vegetable intake among girls. Results from a similar study from the nine Pro Children countries also support that personal and social environmental factors are stronger correlates

of daily fruit and vegetable intake than the physical environmental factors. Mothers' intake and mothers' educational level were not included in this study (133).

4.2 The importance of the factors regarding fruit and vegetable consumption

The importance of the environmental factors in predicting health behaviour has received more attention lately due to increased focus on ecological models where behaviour is thought to be an interplay of personal, social and environmental factors (134). In this study the environmental factors are divided in social environmental and physical environmental factors. The social environmental factors included are mostly related to parental influence, as parents are considered to be the most important social agent impacting upon diet among 11-year-old children (135). Of the physical environmental factors, only availability at home is included.

Personal factors

A high percentage of the Portuguese children reported positively for *liking* and *preferences* for fruit and vegetables. Both personal factors were also associated with daily fruit and vegetable intake. Taste preferences has repeatedly shown to be good predictors of fruit and vegetables in various studies (136-142). To increase the liking and preferences for different fruits and vegetables repeated exposure at early age is found to be a good strategy (143;144). Liking and preferences were also found to be important correlates of fruit and vegetable intake in the other eight Pro Children countries (145;146). However, in Portugal fewer children reported positively to liking and preferences regarding vegetable consumption compared to the other Pro Children countries. Therefore it can be recommended to address these two personal factors in future interventions aimed at increasing vegetable intake among Portuguese children.

Knowledge was found to be associated with daily intake of both fruit and vegetables among Portuguese children. However a low proportion of the children knew the daily recommended intake levels. This was also found in other European countries (147;148), and Sandvik et al. (149) suggest that the low level of knowledge about the recommendations in this age group may be due to difficulties in separating fruits from vegetables. Knowledge has showed

significant relationship with fruit and vegetable intake among children in earlier studies (150-155). Knowledge about the recommendations is a factor that in theory should be simple to increase, and effort should be made to increase the knowledge level among the Portuguese children.

Perceived social environmental factors

In general children report to experience their social environment as supportive towards fruit and vegetable intake.

Perceived *modelling* was one of the most important factors for daily fruit and vegetable intake, and has also shown association with daily fruit and vegetable intake in earlier studies (156-160). Birch (39) suggest that parents acting as models and encouraging their children to try new foods may increase the consumption of previous disliked foods.

A high proportion of the children reported positively to *active parental encouragement*. However, the effect size was not consistent among the five regions, and the factor was only significantly associated with fruit intake in Norte. Parental encouragement is found to have negative impact on fruit and vegetable intake among children in earlier studies (161;162), and needs to be further studied.

The proportion of children that reported positively to *parental facilitation* of fruit and vegetable intake, by cutting, peeling and preparing fruit and vegetables for their children, was much higher in Portugal compared to the other Pro Children countries. This factor is interesting as it differ from the other factors in two ways. First of all, more children reported positively to parental facilitation for vegetables than for fruit. Secondly, more boys reported positively to parental facilitation compared with girls. Why more boys seem to report positively for parental facilitation needs more research, but it may reflect the fact that boys have a lower intake and therefore parents may try to facilitate the consumption more than they do for girls. Parental facilitation turned out to be significantly associated with daily vegetable intake when mother's data was included. This might indicate that mothers who filled in the questionnaires are more concerned with their child's intake, and therefore not representative for the general population.

In this study *demand family rule* was an important correlate of daily fruit and vegetable intake among the Portuguese children. This was also found for the other eight Pro Children

countries (163). The effect of parental control on the intake of fruit and vegetable among children has been widely discussed, and the results are not always corresponding. Some results may indicate a negative effect of parental control (164-166). While the results from other studies seem to support that parental control should be encouraged (167;168). More research is therefore needed to get more insight into the influence of parental food rules.

Perceived physical environmental factors

The availability of fruit and vegetables at home was perceived as high among the Portuguese children, but was only significantly associated with intake of vegetables among girls. The low variation in reported availability at home probably explains why associations between this factor and daily fruit and vegetable intake were not found. Results from the other eight Pro Children countries also show that most children report positively for this physical-environmental factor (169).

The high availability of fruit and vegetables in Portuguese homes may be due to a traditional diet rich in fruit and vegetables. However, high availability does not necessarily implicate high accessibility. The importance of accessibility has been discussed in previous studies (170). Availability at home has been found to be very important in countries with low consumption (89;171), but the importance of this factor might be different in a country with a moderate or high consumption. Also other studies report the importance of availability at home for intake of fruit and vegetables (172-180).

Parents can easily affect the consumption of their children by making fruit and vegetable more available at home. Parental facilitation could also be thought of as a way to increase the accessibility of fruit and vegetables (181). High access to fruit and vegetables is very important for sufficient fruit and vegetable intake, especially for children with low preferences (182;183), but also as accessibility has shown to moderate the relationship between change in preferences and change in intake (184). Increasing the accessibility is in theory a simple strategy as it is sufficient to offer more fruit and vegetables to the children either at home or at school (185).

In this study, availability of fruit and vegetables at school was not included, although other studies from the Pro Children CSS report that the availability at school is low (186;187). Therefore the focus on availability should also include the school and leisure time

environment. As many of the Portuguese children consume their lunch meal at school the effect of improving this meal has the potential to increase the intake of fruit and vegetables among the school children. This is supported by French et al. (188). Focus should also be made on the foods consumed in restaurants and snack bars frequented by children as according to Rodrigues et al. (189) the habit of eating out has increased notably in Portugal in the past few years. The Portuguese population was found to spend, in average, 28% of the total food expenditure on food consumption outside home.

Mothers influence

For the Portuguese children the mothers' intake of fruit and vegetables was associated with daily intake of respectively fruit and vegetables, however stronger for fruit. Earlier studies assessing the parents intake has showed associations with both fruit and vegetable intake among children (22;190-195), while other studies assessing mothers-child correlation of fruit and vegetables intake have found associations between intake of fruit but not vegetables (196;197).

In this study mothers' educational level was associated with children's daily vegetable intake, but not daily fruit intake. According to Roos et al. (198) the educational level is a more important predictor of fruit and vegetable intake in the northern European countries. Educational level among Portuguese mothers is low compared to other European countries. Another reason for not finding a significant association might be the fact that we only looked at mothers' educational level, while other studies have found positive association between the educational level of the household head, which in most cases would have been the father. However, Rasmussen et al. (22) found in a review that parental education in general is positively associated with fruit and/or vegetable consumption, although fathers educational level seem to be less significant when studied alone.

Studies agree that people from higher socioeconomic groups have a healthier diet and consequently a higher intake of fruit and vegetables (22;199). Education was chosen as a measure for socioeconomic status as Portuguese data showed a stronger association between education and food choice than income and food choice (200). This may be due to knowledge, as higher levels of education may increase the ability to acquire and understand health related information. According to two Portuguese studies, i.e. the third Portuguese National Health Survey 1998-1999 and the household budget survey 1994/1995, there is no

clear picture of the effect of education on fruit and vegetable intake or fruit and vegetable availability in households (201;202).

4.3 Differences within Portugal

4.3.1 Gender differences

This study shows that there are gender differences in both the consumption of fruit and vegetables and factors regarding fruit and vegetable consumption among Portuguese children, however not always significant. In general, more girls reported positively towards the different factors, with one exception, parental facilitation. A recent comprehensive review (22;22) found 49 papers where gender differences in fruit and vegetables had been studied. Of these 49 studies, 27 support the finding that girls tend to have a higher or more frequent intake of fruit and/or vegetables. Only five papers observed the opposite. Also other studies support a higher consumption among girls than boys (203;204).

Mothers' educational level was associated with daily vegetables intake only among girls. In Portugal mothers are in general still responsible for purchasing and preparing of food consumed within the family. As it is likely that girls associate themselves more with the mothers than the boys do, the mothers' importance as peer model is possible stronger for girls.

4.3.2 Regional differences

Regional differences were found both for the consumption of fruit and vegetables and associated factors. However, the differences were in general larger for vegetable consumption than for fruit consumption. Norte and Centro were found to be the two regions with the highest reported total fruit and vegetable consumption. In addition to Norte and Centro, Alentejo was among the regions where most children reported positively to the different factors regarding fruit and vegetable consumption. Lisboa was the region where children reported the lowest consumption of fruit, and Algarve the region where the children reported to have the lowest consumption of vegetables. In general Algarve and Lisboa also were the two regions where fewer children reported positively to the different factors

regarding fruit and vegetable consumption. The lower proportion of children reporting positively towards the factors regarding fruit and vegetable consumption in these two regions compared with the other four regions may be a possible explanation for the low consumption level.

It is interesting to observe that the regional differences found for vegetable consumption among mothers are the same as the regional differences among children. Both the mothers and the children in Centro showed the highest consumption of vegetables, while both the mothers and the children in Algarve showed the lowest. It is also interesting to notice that the personal and social environmental factors regarding fruit and vegetable consumption which showed differences between the nine countries participating in the Pro Children CCS, were the same as the factors which showed regional differences within Portugal. Namely: knowledge about the national recommendations, social environmental factors for both fruit and vegetables, and liking of vegetables (205).

No earlier survey assessing the intake among children in the different regions in Portugal have been found, but earlier studies among households (26;206) show differences in food consumption between urban-rural areas. Unfortunately we could not assess the urban-rural differences, therefore we choose to use the five Portuguese regions. Results of this and another Spanish study (207) show that regional differences in both consumption and associated factors can be found.

4.3.3 Differences between the consumption of fruit and the consumption of vegetables

This study shows that children consume more fruit than vegetables, both in portions and frequency. Also, more children report to reach the recommended intake of fruit than of vegetables. In general children also report more positively to factors regarding fruit than to factors regarding vegetables, and the effect sizes of the correlates for daily fruit intake are a bit stronger than the effects sizes of the correlates for daily vegetables intake. These differences in consumption between fruit and vegetables were also found in the other eight Pro Children countries (208-210). In addition the DAFNE data analysed by Naska et al. (211), show that in all ten European countries studied there were less low fruit consumers than vegetable consumers.

In the Pro Children CSS, between country differences were found for the type of vegetables consumed. A north-south gradient was observed between the European countries as the northern countries have a higher intake of raw vegetables and the southern countries, Spain and Portugal, have a higher intake of cooked vegetables and vegetable soup. Sandvik et al. (212) suggest that this may be due to preferences, but also cultural patterns related to food preparation and availability may be important.

The time of the day and how the fruit and vegetables are eaten also seem to be important with respect to the amount of fruit and vegetables consumed. Fruit are often eaten as they are in between meals, as a snack or after a meal as dessert. Vegetables are mostly consumed as part of a meal and therefore need more preparation. Including the children in the preparation of meals has been suggested to be related to higher intakes of fruit and vegetables (213). Studies also show that there might be differences between weekdays and weekends, with more vegetables being consumed during the week and more fruit during weekends (214). Since vegetables often are consumed as part of regular meals, they are suggested to be more out of the personal control and awareness of the children (215). Bogers et al. (216) suggest that this may be the reason for the overall weaker associations between potential correlates and intake levels of vegetables.

A qualitative study, conducted as part of the Pro Children project, shows that children find it is easier to consume fruit than vegetables (217). Children report stronger preferences for fruit, as the taste is sweeter than for vegetables. Vegetables may taste bitter and are therefore not appreciated in the same way (218). A Spanish study (219) also supported that taste preferences are stronger for fruit than for vegetables. In addition, the results also showed that vegetables was one of the food items receiving highest dislike scores as almost half of the children reported a dislike of vegetables in general. These results indicate, as earlier findings, that taste preferences are very important for the consumption of food among children.

In the light of the observed results from this study, future interventions should focus on both fruit and vegetables, but especially vegetables.

4.4 The Portuguese situation

The results from this study show that the intake of fruit and vegetables among both children and their mothers is low compared to the recommendations. This has earlier been supported with household budget surveys (26). Other studies suggest that the intake is decreasing, especially for vegetables, and mainly among people living in urban areas (220). The traditional diet in Portugal is high in both fruit and vegetables, and the Portuguese climate is suitable for production of fruit and vegetables during most of the year, although there is seasonal variation in the types of fruit and vegetables produced. Part of the population might also produce fruit and vegetables for own use. This makes the availability of fruit and vegetables higher, and also keeps the prices down.

A recent study (221) shows that Portugal has a high prevalence of obesity among children compared with other European countries, and that this trend is the same for other Mediterranean countries. Among 7- to 9-year-old children, 31.6 % of the sample was overweighted or obese. The most important risk factors were found to be variables related to family behaviour. Already in 1998 Birch et al. (222) stated that the increased prevalence of overweight among children was a concern because of the increased risk for stigmatization, adult obesity and chronic diseases later in life. Obesity in childhood and adulthood is also linked with increased morbidity and mortality, independently of adult obesity (223). It has been suggested that fruit and vegetables are important in the prevention of the growing trend of overweight and obesity among children as they are high in water and fibre and consequently less energy dense compared to other foods (224). In addition, as fruit and vegetable intake decreases the intake of foods high in sugar and fat increases. This finding is connected with the growing trend of eating outside home which in turn implies a general higher consumption of energy dense food. This indicates that the focus on increasing fruit and vegetable intake is important as part of a lifestyle approach.

4.4.1 Portuguese recommendations for daily intake of fruit and vegetables

Awareness of the recommended intake levels of fruit and vegetables has been shown to be positively related to fruit and vegetable intake among children (225-230). In this study, only about 40 % of the Portuguese children reported to have knowledge about the national

recommendations for fruit and vegetables. Recommendations are guidelines for the consumer as to be able to choose healthy foods, and achieve the health benefits derived from better nutrition. The recommendations should be simple and understandable for the general population, and further easy to remember. The WHO recommends a consumption of at least 400 grams of fruit and vegetables daily (1). The Portuguese recommendations have recently been reviewed and become more food based and thereby more understandable for the general population. In addition, separate recommendations now exist for fruit and vegetables. The new food guide focuses on food portions and recommends a daily consumption of 3-5 portions of fruit and 3-5 portions of vegetables. The standard portion sizes are estimated to be, for fruit a medium piece of raw fruit (160g), and for vegetables either one cup of cooked vegetables (140g) or two cups of raw vegetables (180g). There are no specific recommendations for children, but children above the age of four years and with a normal level of physical activity are estimated to need the middle energy consumption of 2200 kcal per day and are therefore encouraged to consume the average amount of four portions of fruit and four portions of vegetables daily (231).

In view of these new recommendations published in November 2006 (232), an important aim for the future should be to teach the recommendations to all children in elementary schools. The slogan “eat well, live better” was developed and should be easy to remember, also for the children.

4.5 The school as an arena for increasing fruit and vegetable intake

It is important to have an enabling environment in which public health can be promoted (233), and schools might be a good setting to generate a enabling environment for fruit and vegetable consumption. Schools have the potential to influence the students beliefs and attitudes, and nutrition education could give students the tools they need to make healthy choices regarding eating and physical activity (234). The results from the Pro Children CSS show that children perceive the availability of fruit and vegetables at school and during leisure activity as low. The school may therefore be an important arena to increase the consumption of fruit and vegetables for all children in Portugal, as a high proportion of the children eat lunch at school.

Lately there has been an increased focus on the school food environment in Portugal, and recognition of problems has led to new recommendations published by the Ministry of education (235). The report is only meant as a recommendation, and the schools are not obligated to follow the guidelines. Therefore further research is needed to assess compliance with these recommendations. Many schools have snack bars, student stores or vending machines that offer foods high in fat and sugar. The availability of these kind of foods has shown to reduce the consumption of fruit and vegetables (236). Two surveys conducted in the US show that students with access to snack-bar meals versus those students with access to school lunch meals had a lower intake of fruit and vegetables (237;238).

The school setting has shown to be a good arena for intervention studies since it is not only possible to reach the large majority of children, but also their parents. In addition, using school as an arena makes the study more practical to conduct and possible to carry out at low cost. Two studies aiming at increasing the availability/accessibility of fruit and vegetables at school with a subscription programme and a free fruit program showed effect both for subscribing and non-subscribing pupils in Denmark (239) and in Norway (240). This increase in fruit and vegetable intake among children in Norway was maintained also after three years, when distributed for free (241).

4.6 Limitations and methodological issues

The findings of this study should be considered in the light of some limitations which are related to the questionnaire, the design of the study and the data analyses.

4.6.1 The questionnaire

Assessment of the consumption of fruit and vegetables in children is not easy, and it might be difficult to obtain accurate data in large surveys (242). There are different assessment methods available, but time span often limit the possibilities. All data utilized in this thesis were self-reported data, which lead to some limitations for interpretation (243). However, self-reported data may be the only way to assess the beliefs, feelings and experiences of people. The questionnaire developed for this project assessed both intake and potential correlates, and was quite demanding for the children as they had only one school lesson to

fill it in. Individual variation in literacy level is also a potential limitation since it may lead to differences in understanding capabilities among children (244).

Over-reporting of intake and positive reporting towards factors regarding fruit and vegetables intake due to a tendency to give social desirable answers, need to be taken into account as fruit and vegetables are perceived as healthy and social acceptable foods (245;246). The gender differences found among the sample may also be due to this pleasing effect, as girls have shown a higher desire to please than boys (247). Not knowing about the recommendations for fruit and vegetables may also lead to an overestimation of own intake (248). This should be taken into consideration as a high percentage of the children reported not to have knowledge about the national recommendations. However the intake of fruit and vegetable was low and the validity studies did not indicate such overestimation (249). In addition the questionnaire was anonymous and the fact that no right or wrong answers existed was emphasized.

The 24-hour recall assessed the intake of fruit and vegetables on one weekday only and can therefore not be seen as representative for usual intake including day-to-day variation. The validity of intake of fruit juices was low, and therefore fruit juice is not included in the analyses. Earlier studies also reporting difficulties among the children in distinguishing between natural fruit juice and sugar containing drinks based on fruit or with fruit flavour as lemonades, soft drinks, fruit yoghurts, milk-shakes and fruit tea. Qualitative research from focus groups among 10- and 11-year-old children in Belgium and the Netherlands also support that the knowledge about fruit juice was incorrect (250). Other limitation may be due to misunderstanding among the children about what to include as fruit and what to include as vegetables, as only fresh fruit was defined as fruit and vegetables as part as composite dishes was not supposed to be included. Potatoes were not included in the vegetable consumption, but the questionnaire contained a separate question assessing intake of potatoes to avoid misunderstandings. The estimation of portion size (especially of carrots and cucumbers) could also be a limitation, since this may be affected by cultural habits in serving different foods (251). Another limitation may be seasonal differences leading to differences in availability. This is probably more notable for fruit than vegetables, although it is not expected to affect the consumption in Portugal in the same degree as in the northern countries.

The validation of the 24-hour recall among children found a tendency to higher mean intakes measured with the 24-hour recall than the food record. This was found to be due to the division of the day into six time intervals and the photos used for portion estimation. Therefore the questionnaire was adjusted and the final questionnaire divided the day into only three time intervals and used standard portions sizes. The validity of this adapted 24-hour recall was not tested, but the reproducibility was good. The validity and reproducibility of the FFQ were considered to be satisfactory. The validity of the adult questionnaire to assess fruit and vegetables has only been tested in a small sample in Iceland (252). However, it was found to be valid, although only among adults in a population with a low intake.

The factors found to be associated with fruit and vegetable intake in this study were also found to be important factors for fruit and vegetable consumption in the other eight Pro Children countries (253). It might however be possible that other factors as self-efficacy and intention to eat fruit and vegetable may also be important for fruit and vegetable intake.

Many potential factors were included in the analyses, and therefore most factors had to be assessed with only a few questions in order to minimize the size of the questionnaire. This may lead to lower internal consistency of the scales and therefore a lower validity for the factors. Although most factors showed good internal consistency, self-efficacy showed low Cronbach alpha value. The test-retest reliability was also low for self-efficacy among Portuguese children, and therefore this factor was not included in these analyses. It should also be noticed that the test-retest was significantly lower for knowledge about the recommendations among Portuguese children. This may be due to differences between the national recommendations and the WHO population goal and misunderstandings regarding this matter. In these analyses knowledge about the national recommendations of 3-5 portions of fruit and 3-5 portions of vegetables were used as the right answer.

4.6.2 The design

Another potential limitation of this present study is the cross-sectional design, as cross-sectional relationships could not state causality. There is a need for research with longitudinal design to see whether changes in correlates are actually associated with changes in intake (22).

A strong point of this study is its large sample, randomly drawn from a great number of schools in all the five regions in Portugal. The response rate was high, probably because the schools were used as the sampling units, and the questionnaires were filled in during one lecture. Because the survey was school-based we probably limit the response bias caused by overrepresentation of healthy and well-educated individuals. The sample includes a lower number of children from two of the regions, which reflects the population density in these regions, but may lead to loss of power in the statistical analyses when comparing the five regions. Although associations did not always remain significant in the sub samples, the direction of association between the different factors and intake in general pointed in the same direction.

There are three possible levels of attrition, i.e. individuals because they or their parents could choose to participate or not, classes and schools because the teachers and/or headmasters could choose to participate or not, but no reason to believe this caused systematic biases and thereby affected the results. No differences were seen between the children with participating mothers compared to the children without participating mothers. The results can be generalized and are representative for the general population in Portugal.

The division of Portugal into five regions is based on a natural geographic division. This division may not be as good for comparison of food intake, since the food pattern within the regions may differ from the coast to the inland. These geographic differences lead to differences in production as well as the availability and purchasing of fruits and vegetables between the regions. An alternative would have been to look at urban-rural differences. However, this was not possible due to difficulties classifying schools in terms of rural/urban location. Only two schools, with a small number of students, out of the 27 schools were classified as rural. Moreover dividing schools into urban or rural areas would not indicate whether the children live in an urban or rural area.

4.6.3 The analyses

When reporting the average consumption among children, the mean values may be strongly affected by extreme values, therefore median values which are more robust and informative are also presented. In addition the median values are presented due to skewed distribution. Regarding the analyses, the use of non-parametric test may have lead to less statistical

power, as these tests may be less sensitive in detecting existing relationships or differences among groups. However non-parametric tests were used to analyze the data because the data were substantially skewed. The scales of the different factors were dichotomised which lead to loss of variation in the constructs. Regardless of this we chose to report and discuss the proportion of children responding positively because that makes it easier to understand the data presented. We were interested in which of the included factors showing strongest association with daily intake, therefore all factors were entered together in the logistic regression. Data from the mothers were only included in a second model due to a smaller sample size. The small sample size might especially have been a problem for two regions in specific, Alentejo and Algarve, which both have less than 10 percent of the participating children. The small sample size, leading to low statistical power may be the reason why almost none of the factors turned significant for both fruit and vegetable intake in these two regions when including mothers data.

4.7 Conclusion and implication for future research

In the view of the important role of fruit and vegetables in the prevention of disease and promotion of a healthy lifestyle it is important to increase the consumption of these food items. The consumption of fruit and vegetables, and particularly vegetables, was found to be low compared to the international and national recommendations for both children and their parents. Although regional differences were found, the consumption and the frequency of consumption were low in all the five regions. In addition, the intake of vegetables has also showed to be decreasing. More research is needed on how to maintain the traditional dietary pattern with a high amount of fruit and vegetables, at the same time as modern and more international foods are included in the population's diet.

The factors associated with daily fruit and vegetables intake were preferences, liking, knowledge about the national recommendations, modelling and parental demand. Mothers' intake was associated with daily intake of both fruit and vegetables among children, although a weaker associated with daily vegetable intake. Mothers' educational level was only associated with daily vegetable intake. Gender and regional differences were found for the different factors. In general children were more positive towards fruit consumption than

vegetable consumption and gender and regional differences were more notable for vegetable consumption than for fruit consumption.

It has been stated that more research is needed in order to get a better understanding of the parental role both for specific food related practices and more general practices, in predicting healthy and unhealthy food choices among children (254). This study supports the importance of the parents for the consumption of fruit and vegetables among children. However more information is needed about interrelationship between social environmental and physical environmental factors, as well as other parental influences and environmental influences on schoolchildren's fruit and vegetable intake. Studies including more questions for the most important correlates should be carried out to get a better validity and thereby more reliable results.

Availability of fruit and vegetables at home was perceived as good, while the availability outside home has showed to be low. It is important with a school environment supporting healthy lifestyles at the same time as the school setting is a good arena for health promotion. Focus should be made on increasing the availability of fruit and vegetables at school and other places children are frequenting. Higher availability makes fruit and vegetables more accessible at the same time as children are getting more exposed to these food items. High availability and accessibility has previous showed to be important for the consumption.

There is a need for more studies in which personal, social and environmental factors are considered in a longitudinal design. Such future research will generate more information on correlates and mediators of fruit and vegetable consumption among children and adolescents on which coming interventions should be tailored. Due to earlier results showing a rapid change in dietary habits within Portugal, particularly in urban areas, future studies should look at both regional and urban-rural differences.

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Appendix 1

Gender and regional variation in fruit and vegetable consumption and associated factors among 11- to 13 - year old Portuguese children: a cross sectional survey

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Abstract

Background

While the consumption of fruit and vegetables among children is low compared to the recommendations, differences between countries in Europe have been found. Children from Southern European countries tend to report a higher intake, although the intake seems to be decreasing. The objective of this study was to assess the intake of fruit and vegetables and its potential correlates among 11- to 13- year old children in Portugal, with a specific focus on gender and regional differences.

Methods

As part of the international Pro Children project a cross-sectional survey was carried out among 11- to 13- year old Portuguese schoolchildren. Data was collected by means of self-administered questionnaires among children and one of their parents. Fruit and vegetable intake was assessed using a 24-hour recall and food frequency questions. The potential correlates were divided into demographic, personal, perceived social-environmental and perceived physical-environmental factors.

Results

Data from 2134 children and 1314 mothers were included in the analyses. Children's consumption of fruit and vegetables was low for both genders and in all regions. Boys reported less frequent intake than girls, and pupils from the regions of Lisboa and Algarve reported the lowest and less frequent intakes of respectively fruit and vegetables. The mothers also showed a low consumption of both fruit and vegetables. Regional differences were observed for vegetables and mothers in Algarve reported the lowest intake. The personal factors, i.e. knowledge, liking and preferences, and two social-environmental factors: modelling and demand family rule, in addition to mother's intake, were strongest associated with daily intake among the children. Gender and regional differences were also found for the correlates.

Conclusions

Fruit and vegetable intake among Portuguese children, although high in the European setting, is low compared to the recommendations. However, children are positive to factors regarding intake. Gender and regional differences were found both for

consumption of fruit and vegetables, and for the associated factors. Future efforts to increase the consumption of fruit and vegetables in Portugal ought to focus on the consumption of vegetables, and in particular to address personal and social-environmental factors, in addition to parental intake.

Background

Fruit and vegetable consumption among European children has shown to be low compared with the WHO population goal and national recommendations. There are differences between the European countries, however the results show that the consumption in general is low in all countries [1,2]. In addition, a decrease in intake of fruit has been observed during recent years [1]. In view of the importance of an adequate fruit and vegetable consumption in the prevention of chronic diseases later in life, there is a need to increase the consumption among children [3]. Children and adolescents are an important target group since they have higher physiological needs for nutrients as they grow, but also since healthy food habits acquired early in life have shown to track into adolescents and adulthood [4-7]. In addition food preferences and habits may still be modifiable during childhood [8].

In order to increase the intake of fruit and vegetables among children, insight into important and changeable correlates of fruit and vegetable consumption is needed. In the past few years an increasing number of European studies of fruit and vegetable consumption among children have been conducted. The Pro Children cross-sectional survey was designed to gather information about the actual consumption and correlates of fruit and vegetables consumption among 11- to 13-year-old children and their parents in nine European countries: Austria, Belgium, Denmark, Iceland, the Netherlands, Norway, Portugal, Spain and Sweden. The results showed that the consumption was low in all countries [2,9], although the children in general had a positive attitude towards fruit and vegetables consumption [10]. A combination of personal, social and environmental factors were found to be associated with daily intake. The factors were more consistent across the countries for fruit intake than for vegetable intake [9]. Gender differences were found for the total sample for both fruit and vegetables intake [2,9]. Between country differences were also found. No North-South gradient in fruit and vegetable consumption as reported in previous studies [11-14] could be found. It has been suggested that people in the southern countries are changing their dietary habits, and gradually adopting a more “northern” diet including more meat and animal fat [12,15]. Investigating gender and regional differences

within a country along with other established determinants of fruit and vegetable intake might give new insight into how this change process is occurring.

Portugal has been found to be one of the European countries with the highest fruit and vegetable consumption among children [2,9] and their mothers [16]. In addition, the majority of Portuguese children has been found to hold positive attitudes and regard their social environment as supportive towards fruit and vegetable consumption [10]. However, the intake of fruit and vegetables is low compared with both national [17] and international recommendations [2]. The traditional diet in Portugal, as in other Southern European countries, has a high content of fruit and vegetables and is often referred to as the “Mediterranean diet” [18]. Presently, Portugal has no updated data on the dietary habits of the general population as the only Portuguese national dietary survey was conducted more than 25 years ago (in 1980) [18].

Recent socio-demographic and economic changes in Portugal, as well as changes in food availability, may indicate that the Portuguese have acquired different dietary habits over the past decades [18]. The observed decrease in the mean availability of fruit and vegetables from 1990 to 2000 [19], together with a high prevalence of overweight and obesity among children [20], further state the need to focus on the promotion of fruit and vegetable intake among children as an important health-related policy objective.

The aim of this present study was to assess the intake of fruit and vegetables among Portuguese children both in grams per day and usual frequency of intake, as well as among their mothers. Proportion of children reporting positively to factors regarding fruit and vegetable consumption and correlates of daily fruit and vegetable intake were also assessed. Focus has been made on gender and regional differences in consumption and associated factors.

Methods

Study population

Schools were chosen as the sampling unit, and 2535 children from 27 schools, randomly distributed and from all the five Portuguese regions (Norte, Centro, Lisboa e vale de Tejo (Lisboa), Alentejo and Algarve) and an equal number of parents were

included. This sample size was regarded as sufficient for within-country comparisons [21]. The response rate was high with 98.4% of the children and 83.4% of the parents participating. Data from 2134 children and 1660 parents, of which 79.2% were mothers, was entered after exclusion of questionnaires due to lack of reliability and parental written consent [2,16]. Only mothers' data are included in the analyses (n = 1314). Written consents from the parents were obtained before including the children in the cross-sectional survey. The completion of the questionnaire was voluntary and parents could demand their child's questionnaire should to be destroyed. The Pro Children project adheres to the Helsinki Declaration and the convention of the Council of Europe on human rights and biomedicine.

The instrument

A precoded self- administered questionnaire was developed (<http://www.prochildren.org>) to assess fruit and vegetable intake as well as possible correlates. All children were asked to fill in the questionnaire during one school session, in the classroom under the supervision of the classroom teacher. In addition, all participating children received a closed envelop with a questionnaire to take home to be filled in by one of their parents. This questionnaire was again returned by the children to the classroom teacher.

Fruit and vegetable consumption was assessed with both a 24-hour recall asking about yesterday's fruit and vegetable intake and food frequency questions (FFQ) measuring usual daily fruit and vegetable intake. The 24-hour recall was divided into three time intervals including several eating occasions (morning/before school, at school/during lunch and afternoon/supper/after supper), and the reported amount was recoded into standardized portion sizes in grams. This 24-hour recall was used for measuring group mean intake and for specifying the type of fruit and vegetables consumed [22,23]. The FFQ included one question assessing daily intake of fresh fruit and three questions assessing daily vegetable intake (salad, raw vegetable and cooked vegetables). This FFQ was used to rank subjects according to their usual intake [22,23].

The potential *correlates* were divided into demographic, personal, perceived social environmental and perceived physical environmental factors. In addition parental

intake reported by the parents was included. The demographic factors included were gender, age and region. Mothers' intake and educational level was included from the parents' questionnaire. The personal factors included were knowledge about the national recommendations, general liking of fruit and vegetables and preferences for 12 different kinds of fruit and vegetables. The social environmental factors were modelling, active parental encouragement, demand family rule and parental facilitation. Of the physical-environmental factors only availability at home was included. All factors except knowledge about the national recommendations were assessed using a bipolar five-point scale, ranging from never/I fully disagree/dislike very much (= -2) to yes, always/I fully agree/like very much (= 2). Prior to data collection, validity and reliability of questionnaires have been tested in separate studies. Further information about the reliability and validity of the potential correlates assessed in the children's questionnaire [24], as well as reliability and validity of the dietary part of the children's questionnaire [22] and the dietary part of the parents' questionnaire [23] has been previously published.

Statistics

The programme software SPSS (Statistical package for Social Science) version 14.0 was used for all analyses. All p-values are two-sided and 5% level of significance was used. Analyses were done separately for fruit and vegetables. First descriptive statistics were conducted. Also the proportions of the children consuming 400 grams, i.e. the amount recommended by the WHO [3] were assessed. Second, differences in intake were assessed using both the 24-hour recall and the FFQ. Non-parametric tests were used due to skewed data. Third, proportions of children responding positively to the different factors were assessed [10]. Only results from the different genders and regions will be presented since results for the total Portuguese sample have been published previous [10]. Finally, logistic regression analyses were run to assess possible correlates of daily fruit and vegetable intake [9]. Data from the mothers, i.e: mothers' frequency of intake and educational level, was only included in a second model to maintain the large sample and statistical power. The results from the logistic regression will only be presented from girls and boys separately, and regions due to previous publications [9].

Results

Characteristics of the sample

Characteristics of the study population are shown in Table 1. The largest proportion of children came from Norte, while less than 10 percent came from each of Alentejo and Algarve regions. The mean age was 11.5 years (SD = 0.45) and the gender distribution was almost equal.

Intake of fruit and vegetables

The children's intake of fruit from the 24-hour recall and the FFQ are shown in Table 2. For fruit intake in grams no gender differences were found. Gender differences were, however, found for daily intake ($p < 0.05$) as more girls reported to eat fruit daily. Regional differences were found both for the intake in grams ($p < 0.001$) and for daily intake ($p < 0.001$). The highest mean intake of fruit was in Norte and the lowest in Lisboa. Centro had the highest amount of children reporting to consume fruit daily while Lisboa also were the region with the lowest number of daily fruit consumers. The children's intake of vegetables from the 24-hour recall and the FFQ are shown in Table 3. For vegetable intake in grams no gender differences were found. Less children reported to consume vegetables daily compared with fruit, but also here gender differences ($p < 0.001$) were found. Again more girls reported to consume vegetables daily compared with boys. Regional differences were found both for intake in grams ($p < 0.001$) and for daily intake ($p < 0.001$). Centro was the region with the highest mean intake of vegetables as well as with the highest percentage of children reporting to consume vegetables daily. Both the lowest mean intake of vegetables and the lowest percentage of children consuming vegetables daily were found in Algarve. Only 21.4% of the children reported to reach the WHO recommendation of 400 grams of fruit and vegetables per day. No significant gender differences were found, but regional differences were found ranging from 11.8% of the children in Algarve to 25.4% of the children in Norte.

The mean intake of fruit and vegetables was higher for the mothers than for the children, 211 grams (median = 200, SD = 126) and 169 grams (median = 160, SD = 110) for fruit and vegetables respectively. Regional differences ($p < 0.05$) could only be seen for vegetable consumption, with the highest mean consumption in Centro and

the lowest mean consumption in Algarve, 181 grams (median = 180, SD = 108) and 141 grams (median = 140, SD = 100) respectively. The proportion of mothers who reported a daily intake of fruit and vegetables was also higher than the proportion of children reporting a daily intake. For fruit, 72.5% of the mothers reported a daily intake, and for vegetables 70.4% reported a daily intake. No significant differences were found between the regions. However, the consumption is still low compared with the recommendations, with only 44.0% of the mothers consuming more than 400 grams of fruit and vegetables per day.

Proportion reporting positively to factors regarding fruit and vegetable consumption

Table 4 and 5 show the proportion of girls and boys in each region reporting positively to the different factors regarding fruit (Table 4) and vegetable (Table 5) consumption. Overall the children tended to report more positively to all factors regarding fruit intake than factors regarding vegetable consumption. However, one exception was found for parental facilitation, with more children reporting parental facilitation for vegetable intake than parental facilitation for fruit intake.

Fruit

Gender differences were found for two of the personal factors; liking ($p < 0.05$) and preferences ($p < 0.001$), with girls being more positive than boys. However most children like fruit and vegetables in general, and report strong preferences for specific kinds of fruits and vegetables. Regional differences were only found for knowledge about the recommended intake levels ($p < 0.05$), with Centro showing least and Alentejo showing most children reporting correct knowledge. For the social environmental factors, the only significant gender differences was found for parental facilitation ($p < 0.001$), with more boys reporting positively than girls. Regional differences were found for active parental encouragement ($p < 0.05$), demand family rule ($p < 0.05$) and parental facilitation ($p < 0.05$). The proportion of children reporting to perceive their parents to actively encourage and also to demand them to eat fruit daily was lowest in Algarve and highest in Alentejo and Centro. For parental facilitation, the proportion of children responding positively was lowest in Lisboa and highest in Centro. No gender or regional differences were found for the physical

environmental factor availability at home, as almost all the children reported that fruit was available at home always or on most days.

Vegetables

No gender differences were found for the personal factors. Regional differences were observed for reported knowledge about the recommendations ($p < 0.001$) and liking ($p < 0.05$). The proportion of children reporting correct knowledge was lowest in Centro and highest in Alentejo. For liking, Algarve had the lowest number of children reporting positively and Alentejo together with Centro the highest. No gender differences were found for the social environmental factors. Regional differences were found for modelling ($p < 0.001$) which was lowest in Algarve and highest in Centro, demand family rule ($p < 0.05$) which was lowest in Algarve and highest in Alentejo and parental facilitation ($p < 0.05$) which was lowest in Algarve and highest in Centro. No gender or regional differences were found for physical environmental factors. A high proportion of the children also reported that vegetables were available at home always or on most days.

Correlates of daily fruit and vegetable intake

Table 6 and 7 show the results from the logistic regression analysis for fruit (Table 6) and for vegetables (Table 7) for both genders and for the different regions. When including mothers' data in a second model, the sample size decreases dramatically (fruit $n = 999$, vegetables $n = 1002$). Since only small differences between both models were found, results from the analyses conducted including only data from the children's questionnaire are presented.

Daily fruit intake

A similar pattern was seen for both girls and boys for daily fruit intake with all three personal factors and modelling yielding significance. In addition demand family rule yielded significance for girls. Daily fruit intake was more likely to be reported by children with a preference for many different fruits, with a positive liking for fruits, who experienced positive role models, who had knowledge about the national recommendations and by those who perceived their parents to demand them to eat fruit every day. When including mothers' data, mothers' intake of fruit was significantly associated with daily fruit intake for both girls and boys.

Regional differences for the correlates associated with daily fruit intake were found, however the pattern was quite similar. Although, in Algarve none of the potential correlates were significant, which may be due to the small sample size. In most regions daily fruit intake was associated with knowledge about the national recommendations, preferences for many different fruits, modelling, liking and demand family rule. Only in Norte, parental encouragement was significantly associated with daily fruit intake. Mothers' intake of fruit was significantly associated with daily fruit intake in Norte, Lisboa and Alentejo.

Daily vegetable intake

Also for the correlates of daily vegetables intake the three personal factors and modelling yielded significance both for girls and boys. In addition parental facilitation and availability at home yielded significance for girls, and demand family rule yielded significance for boys. Daily vegetable intake was more likely to be reported by children with a positive liking for vegetables, knowledge about the national recommendations, with a preference for many different vegetables, who experienced positive role models, by those who perceived their parents to demand them to eat vegetables every day and also by those who experiences parental facilitation for vegetables consumption. When including mothers' data, only mothers' educational level was significantly associated with daily vegetable intake in girls.

There were some regional differences for the correlates associations with daily vegetables intake. Gender was significant in Norte, Centro and Lisboa, with a higher likelihood of daily vegetables intake if being a girl. Mothers' intake of vegetables was significantly associated with daily vegetable intake only in Lisboa and mother's educational level was significantly associated with daily vegetable intake only in Norte.

Discussion

This study showed that Portuguese children and mothers report low consumption rates of fruit and vegetables in all five regions. Only an average of 21.4% of the children and 44.0% of the mothers reported to consume 400 grams of fruit and vegetables, i.e. the amount recommended by the WHO [3]. The intake of vegetables was even lower

than for fruit. Both gender and regional differences were found for intake. Girls have a more frequent consumption of both fruit and vegetables than boys of the same age. A recent comprehensive review [25] found 49 papers where gender differences in fruit and vegetables had been studied. Of these 49 studies, 27 support the finding that girls tend to have a higher or more frequent intake of fruit and/or vegetables. Only five papers observed the opposite. Lisboa was found to be the region where children reported the lowest and less frequent intake of fruit. Both intake and frequency of intake of vegetables were also found to be low in Lisboa. People in urban areas have been suggested to be the ones changing the dietary habits more rapidly, moving away from the traditional diet. However a previous study found that urban areas have a higher consumption of fruit than more rural areas [18]. Why we found the opposite result may have various explanations, but children in Lisboa were among those reporting less positively to factors regarding fruit intake. Why Algarve is the region where both children and their mothers reported the lowest and less frequent intake of vegetables may also partly be explain by the low proportion of children reporting positively to factors regarding vegetables in this region. The low consumption of fruit and vegetables among Portuguese children is supported by the HBSC study [1]. Both the Pro Children study and the HBSC study show that even though the intake of fruit and vegetables among Portuguese children is high in the European setting, it is low compared with the recommendations [1,2]. To our knowledge, regional differences in intake of fruit and vegetables among Portuguese children have not been studied previously. Earlier studies among households [18,19] show differences in food consumption between urban-rural areas. Results of this, and another Spanish study [26] show that regional differences in both consumption and correlates can be found.

The children, in general, have a positive attitude towards fruit and vegetable consumption, although children are more positive towards fruit consumption than vegetable consumption. The most important correlates of daily fruit and vegetable intake for both girls and boys and in the different regions were found to be the personal factors: i.e. knowledge, liking, preferences, and social environmental factors: i.e. modelling and demand family rule. In addition, mother's daily intake of fruit and vegetables was an important factor. The effect sizes were in general larger for factors associated with daily fruit intake than for daily vegetable intake. This is in line with the previous results from the other countries in the Pro Children study [9]. Gender and

regional differences were found for demographic, personal and social environmental factors as well as mother's intake. Girls are more positive to factors regarding fruit and vegetable consumption than boys, although not always significant. An exception is parental facilitation. Why more boys report positively to parental facilitation compared with girls needs to be further assessed, but may reflect the fact that boys have a lower intake and therefore parents may try to facilitate the consumption more than they do for girls. It is also interesting to notice that the personal and social environmental factors that showed regional differences within Portugal are the same as in the Pro Children study looking at country differences, namely: knowledge about the national recommendations, social environmental factors for both fruit and vegetables, and liking of vegetables [10]. A qualitative study conducted in Belgium and the Netherlands shows that children report not to eat fruit and vegetables because they don't like them [27]. This is also supported by a Spanish study [26]. Children also seem to prefer fruit to vegetables because of taste preferences [26,27].

The level of knowledge was low, with less than half of the children being aware that the national recommendations were 3-5 portions of fruit per day. It has previously been suggested that the low level of knowledge about the recommendations in this age group may be due to difficulties in separating fruits from vegetables [10]. Knowledge is a factor that in theory should be simple to increase, and in view of the new dietary recommendations in Portugal, published in November 2006 [17], an important aim for the future should be to teach the recommendations to all children in elementary schools. Availability at home did not show to be associated with fruit and vegetable intake, although almost all children reported positively towards this physical environmental factor. However, high availability does not necessarily implicate high accessibility. The importance of accessibility has been discussed in a previous study [28]. Other studies from the Pro Children cross-sectional survey report that the availability of fruit and vegetables at school is low [9,10,27]. Lately there has been an increased focus on the school food environment in Portugal, and recognition of problems has lead to new recommendations published by the Ministry of education [29]. A high proportion of the Portuguese children eat lunch at school, and schools might be a good setting to generate an enabling environment for fruit and vegetable consumption. In addition, schools have the potential be a good arena for intervention studies since it is not only possible to reach the large majority of children, but also

their parents. Social and environmental factors may mediate the relationship between availability and fruit and vegetable intake, and therefore availability may not show association with fruit and vegetable intake in this study. This could not be measured due to cross-sectional study design. Further research is needed to explore the interrelationships between personal and environmental factors.

For the Portuguese children the mothers' intake of fruit was associated with daily intake of fruit among both genders and in three regions. The mothers' intake of vegetables was only associated with daily vegetable intake in one region. Earlier studies assessing the parents intake has showed associations with both fruit and vegetable intake among children [25,30,31]. Mothers' educational level was only associated with daily vegetables intake among girls and in one region. In Portugal mothers are in general still responsible for purchasing and preparing of food consumed within the family. As it is likely that girls associate themselves more with the mothers than the boys do, the mothers' importance as peer model is possible stronger for girls. Rasmussen et al. [25] found that parental education in general is positively associated with fruit and/or vegetable consumption. Portuguese data has also reported that education is associated with fruit and vegetables intake among adults [32]. This may be due to knowledge, as higher levels of education may increase the ability to acquire and understand health related information.

The study has some limitations. Fruit and vegetables are perceived as healthy and social acceptable foods which may lead to a tendency to give social desirable answers. Not knowing the recommendations may also lead to overestimation of intake [27]. The design is cross-sectional, and can not state causality. Longitudinally analyses are needed to assess whether the correlates are actually predicting daily fruit and vegetable intake. All data are self-reported. However, self-reported data may be the only way to assess the beliefs, feelings and experiences of people. Moreover, the validity and reproducibility were found to be good both for consumption and correlates [22-24]. The processing and quality control of the data [21] and the prior validity and reliability studies are a strength of this study. Although future research should include more questions on the most important correlates, and also mediation analyses and interaction analyses among these correlates. Finally, geographical regions may not be the best way to divide Portugal when looking at intake.

Unfortunately we could not assess the urban-rural differences, due to difficulties classifying schools in terms of rural/urban location. Therefore we choose to use the five geographic regions. When looking at the five regions separately, the smaller sample size in each region may lead to decreased statistical power. Because the distribution of children is not equal among the five regions, this is especially the case for the two regions, Alentejo and Algarve which both have less than 10 percent of the participating children. However the total sample was large and participating pupils were from all regions. Therefore the results can be generalized to all children in Portugal.

Conclusions

This study supports the previous results showing that the consumption of fruit and vegetables among Portuguese children and their mothers is far below the recommendations. However, Portuguese children are positive towards factors regarding fruit and vegetable intake. Gender differences were not seen for fruit and vegetable intake in grams, but significant more girls reported to consume both fruit and vegetables daily. Some gender differences were also observed for the factors regarding fruit and vegetable consumption and for correlates of daily fruit and vegetable intake. Although significant regional differences were found, the consumption was low in all the five regions. The consumption of vegetables was in particular low. In general Lisboa and Algarve are the two regions with both the lowest consumption, and where children were less positive towards fruit and vegetable consumption. Studies assessing the importance of different factors regarding fruit and vegetable consumption among children are necessary to design effective interventions that aim at changing the most important correlates of fruit and vegetable intake. This present study shows that knowledge, liking, preferences, modelling and demand family rule, in addition to mother's intake, are the most important correlates of fruit and vegetable consumption among both girls and boys and in different regions in Portugal. Future studies should focus on personal and social environmental factors to increase the consumption, especially for vegetables. In addition, parents are important models and availability of fruit and vegetables outside the home environment should receive attention. Future studies should also focus on gender and region, as well as investigate the urban-rural differences.

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Competing interests

The authors declare that they have no competing interests.

Authors' contributions

OV performed the statistical analysis and wrote the manuscript under supervision by MW. All co-authors contributed to the formulation of research questions. MVDA and KIK participated in designing the study. MDVA, BF and KIK provided critical comments to the manuscript. All authors have read and proved the final version.

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Table 1: Characteristics of the study population: The Portuguese Pro Children Study

Characteristics		N	%
Region	Norte	766	35.9
	Centro	461	21.6
	Lisboa ¹	543	25.4
	Alentejo	176	8.2
	Algarve	188	8.8
Gender	Girls	1122	52.6
	Boys	1012	47.4
Age	11 years	1270	59.5
	> 11 years	864	40.5
Educational level of mother			
	<10 years	723	62.0
	≥10 years	443	38.0

¹ Lisboa = Lisboa e vale de Tejo

Table 2: Intake of fruit (in grams) from the 24-h recall, and percentage of children reporting daily fruit intake from the FFQ¹: The Portuguese Pro Children Study

Fruit	24-hour recall (grams)									FFQ (%)		
	Total sample (n= 2118)					Girls (n= 1115)		Boys (n=1003)		Total sample (n=2095)	Girls (n=1107)	Boys (n=988)
	Mean	95% CI	Median	25 th	75 th	Mean	Median	Mean	Median			
Total	153	147-158	150	50	200	152	150	153	125	56.5	59.0	53.7
Norte	165	155-174	150	100	200	164	150	165	150	55.8	59.7	51.8
Centro	153	143-164	150	100	200	156	150	149	150	63.2	65.5	60.4
Lisboa ²	132	122-141	100	50	200	126	100	137	100	49.6	49.4	49.8
Alentejo	156	137-176	150	50	200	151	150	165	150	59.8	60.7	58.2
Algarve	159	141-177	150	100	200	166	150	152	100	59.6	63.5	55.2

¹ FFQ = food frequency questions

² Lisboa = Lisboa e vale de Tejo

Table 3: Intake of vegetables (in grams) from the 24-h recall, and percentage of children reporting daily vegetables intake from the FFQ¹: The Portuguese Pro Children Study

Vegetables	24-hour recall (grams)									FFQ (%)		
	Total sample (n=2118)					Girls (n=1115)		Boys (n=1003)		Total sample (n=2110)	Girls (n=1112)	Boys (n=998)
	Mean	95% CI	Median	25 th	75 th	Mean	Median	Mean	Median			
Total	111	107-115	80	30	160	112	90	110	80	50.1	55.8	43.9
Norte	117	110-124	96	40	170	114	100	120	90	51.0	57.2	44.5
Centro	123	113-132	100	40	180	128	120	116	100	58.2	64.3	50.5
Lisboa ²	101	93-110	80	0	160	100	80	103	80	45.0	51.1	39.0
Alentejo	118	101-134	100	30	180	113	80	125	100	53.1	54.2	51.5
Algarve	80	67-94	60	0	120	91	80	69	40	38.7	41.7	35.6

¹ FFQ = food frequency questions

² Lisboa = Lisboa e vale de Tejo

Table 4: Proportion (%), with 95% confidence intervals of boys/girls reporting positively to factors regarding fruit intake: The Portuguese Pro Children Study

Correlates	Regions									
	Norte		Centro		Lisboa ¹		Alentejo		Algarve	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
<i>Personal factors</i>										
Knowledge	42.8 (37.9-47.7)	41.8 (36.8-46.9)	40.0 (33.9-46.1)	45.3 (38.4-52.1)	44.4 (38.5-50.3)	38.0 (32.1-43.9)	57.5 (48.0-67.1)	57.4 (45.5-69.3)	44.8 (34.7-54.9)	48.9 (38.6-59.2)
Liking	95.4 (93.1-97.7)	93.4 (91.0-95.7)	97.7 (95.3-100)	94.4 (91.8-97.1)	92.8 (89.8-95.8)	93.9 (90.9-97.0)	98.1 (94.3-100)	92.6 (87.9-97.3)	94.7 (88.8-100)	86.4 (80.3-92.5)
Preferences	95.4 (92.9-97.8)	91.3 (88.7-93.8)	94.9 (91.7-98.2)	88.6 (84.8-92.3)	93.2 (89.9-96.6)	89.9 (86.5-93.2)	93.3 (88.4-98.3)	92.4 (86.2-98.7)	96.8 (92.7-100)	94.6 (90.4-98.8)
<i>Perceived social environmental factors</i>										
Modelling	83.7 (79.9-87.5)	81.1 (77.2-85.0)	85.5 (81.0-90.0)	82.5 (77.4-87.6)	79.9 (75.1-84.6)	81.3 (76.6-86.1)	81.1 (73.5-88.8)	79.1 (69.5-88.7)	87.2 (79.3-95.2)	73.6 (65.3-81.8)
Active parental encouragement	77.5 (73.2-81.9)	76.9 (72.5-81.3)	84.0 (79.1-88.9)	79.9 (74.3-85.4)	77.9 (72.7-83.1)	78.8 (73.6-84.1)	84.4 (76.9-91.9)	82.8 (73.6-92.0)	69.3 (59.8-78.9)	73.5 (63.6-83.3)
Demand family rule	74.6 (70.2-79.0)	73.6 (69.1-78.1)	77.2 (72.1-82.3)	80.0 (74.1-85.9)	77.1 (71.9-82.3)	74.5 (69.2-79.8)	87.7 (80.7-94.8)	77.6 (68.8-86.5)	65.6 (55.9-75.3)	67.8 (57.8-77.8)
Parental facilitation	32.2 (27.4-37.0)	40.1 (35.2-45.0)	39.5 (33.4-45.6)	45.7 (38.8-52.6)	26.2 (20.5-31.9)	38.8 (33.1-44.4)	31.1 (21.9-40.3)	49.3 (37.7-60.8)	34.4 (24.5-44.3)	39.8 (29.6-50.0)
<i>Perceived physical environmental factors</i>										
Availability at home	95.3 (93.0-97.7)	92.7 (90.3-95.1)	90.2 (86.7-93.6)	93.0 (89.1-96.9)	95.4 (92.4-98.4)	91.6 (88.7-94.6)	96.3 (92.3-100)	94.1 (89.1-99.1)	93.7 (88.0-99.4)	88.8 (82.9-94.7)

¹ Lisboa = Lisboa e vale de Tejo

Table 5: Proportion (%), with 95% confidence intervals of boys/girls reporting positively to factors regarding vegetable intake: The Portuguese Pro Children Study

Correlates	Regions									
	Norte		Centro		Lisboa ¹		Alentejo		Algarve	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
<i>Personal factors</i>										
Knowledge	38.1 (33.3-43.0)	37.9 (33.0-42.9)	30.8 (25.0-36.6)	35.4 (28.8-41.9)	38.9 (33.0-44.9)	36.2 (30.2-42.1)	59.6 (50.1-69.2)	40.6 (28.8-52.3)	38.5 (28.6-48.5)	42.7 (32.4-53.0)
Liking	65.0 (60.3-69.8)	64.5 (59.6-69.4)	68.1 (62.3-73.9)	64.1 (57.5-70.7)	64.6 (58.8-70.5)	63.6 (57.8-69.4)	66.7 (58.2-75.2)	82.1 (71.4-92.7)	57.4 (47.3-67.6)	50.0 (39.6-60.4)
Preferences	50.4 (45.4-55.4)	43.4 (38.3-48.6)	52.0 (45.8-58.1)	53.3 (46.3-60.3)	53.6 (47.6-59.7)	52.7 (46.6-58.7)	53.8 (44.3-63.4)	62.7 (50.7-74.6)	52.7 (42.4-63.0)	50.6 (40.1-61.1)
<i>Perceived social environmental factors</i>										
modelling	74.0 (69.4-78.5)	69.5 (65.0-74.1)	74.1 (68.7-79.6)	72.7 (66.6-78.9)	60.7 (54.8-66.6)	66.0 (60.2-71.9)	62.9 (53.8-71.9)	73.8 (62.3-85.3)	56.4 (46.4-66.4)	62.5 (52.1-72.9)
Active parental encouragement	73.1 (68.3-77.9)	63.0 (58.2-67.8)	76.2 (70.6-81.7)	70.9 (64.5-77.4)	67.8 (61.8-73.9)	66.5 (60.6-72.5)	69.1 (60.2-78.1)	80.3 (69.6-91.0)	65.2 (55.4-75.0)	71.1 (60.4-81.7)
Demand family rule	64.2 (59.4-69.0)	64.1 (59.2-69.0)	68.3 (62.4-74.1)	65.7 (59.1-72.2)	61.0 (55.1-66.9)	64.0 (58.0-69.9)	76.2 (67.7-84.6)	71.6 (61.1-82.2)	55.3 (45.2-65.5)	57.8 (47.4-68.1)
Parental facilitation	52.3 (47.3-57.3)	53.9 (48.8-59.0)	57.2 (51.0-63.4)	54.4 (47.4-61.4)	46.3 (40.1-52.4)	47.9 (41.7-54.0)	49.5 (39.8-59.2)	53.7 (41.6-65.8)	42.6 (32.5-52.6)	40.0 (29.7-50.3)
<i>Perceived physical environmental factors</i>										
Availability at home	82.5 (78.7-86.2)	83.0 (79.1-86.8)	81.6 (76.8-86.4)	81.3 (75.9-86.8)	79.2 (74.2-84.1)	79.2 (74.2-84.2)	86.7 (80.1-93.3)	86.6 (78.3-94.8)	79.6 (70.8-88.3)	72.2 (63.3-81.1)

¹ Lisboa = Lisboa e vale de Tejo

Table 6: Logistic regression (OR and 95% CI) with reported frequency of daily fruit intake as dependent variable and demographic, personal, social environmental, and physical environmental factors per region: The Portuguese Pro Children Study

Fruit Variables	Total sample		Regions				
	Girls (n=946)	Boys (n=814)	Norte (n=656)	Centro (n=380)	Lisboa ¹ (n=427)	Alentejo (n=148)	Algarve (n=149)
Region							
Norte	1(ref)	1(ref)					
Centro	1.25(0.85-1.82)	1.35(0.90-2.04)					
Lisboa ¹	0.72(0.50-1.04)	1.07(0.74-1.55)					
Alentejo	0.82(0.50-1.35)	1.03(0.56-1.88)					
Algarve	0.94(0.56-1.59)	1.02(0.59-1.77)					
Gender							
Girls			1(ref)	1(ref)	1(ref)	1(ref)	1(ref)
Boys			0.76(0.54-1.06)	0.85(0.55-1.33)	1.18(0.78-1.80)	1.07(0.49-2.32)	0.79(0.40-1.59)
Age							
11 years	1(ref)	1(ref)	1(ref)	1(ref)	1(ref)	1(ref)	1(ref)
> 11 years	1.16(0.87-1.53)	0.91(0.67-1.23)	0.82(0.58-1.15)	1.25(0.80-1.96)	1.22(0.80-1.87)	1.36(0.64-2.87)	0.72(0.36-1.45)
<i>Personal factors</i>							
Knowledge	<u>1.78</u> (1.34-2.36)	<u>2.02</u> (1.50-2.73)	<u>1.85</u> (1.32-2.61)	<u>1.67</u> (1.06-2.63)	<u>2.19</u> (1.43-3.34)	<u>2.87</u> (1.34-6.14)	1.94(0.97-2.88)
Liking	<u>3.75</u> (1.72-8.17)	<u>2.31</u> (1.15-4.64)	<u>4.44</u> (1.60-12.34)	2.06(0.56-7.60)	<u>3.24</u> (1.13-9.30)	8.92(0.86-92.24)	0.68(0.18-2.62)
Preferences	<u>3.60</u> (1.83-7.06)	<u>2.67</u> (1.53-4.66)	<u>3.58</u> (1.57-8.13)	<u>3.0</u> (1.29-6.95)	<u>3.96</u> (1.70-9.23)	1.55(0.36-6.64)	1.47(0.20-10.72)
<i>Perceived social-Environmental factors</i>							
Modelling	<u>2.08</u> (1.41-3.06)	<u>1.86</u> (1.24-2.77)	<u>1.83</u> (1.16-2.91)	1.63(0.85-3.13)	<u>2.13</u> (1.19-3.81)	<u>4.49</u> (1.57-12.83)	1.53(0.59-3.97)
Active parental encouragement	0.90(0.60-1.36)	1.06(0.69-1.62)	<u>1.61</u> (1.00-2.60)	0.93(0.44-1.94)	0.67(0.36-1.24)	0.30(0.09-1.07)	0.59(0.24-1.49)
Demand family rule	<u>1.58</u> (1.07-2.32)	1.45(0.97-2.17)	<u>1.61</u> (1.03-2.54)	1.06(0.54-2.10)	<u>2.52</u> (1.38-4.57)	2.91(0.92-9.26)	0.76(0.32-1.77)
Parental facilitation	1.12(0.82-1.51)	0.98(0.72-1.32)	1.18(0.83-1.69)	0.87(0.55-1.37)	1.02(0.65-1.61)	0.86(0.40-1.87)	1.35(0.65-2.79)
<i>Perceived physical Environmental factors</i>							
Availability at home	1.21(0.64-2.27)	1.11(0.60-2.07)	1.30(0.59-2.91)	0.61(0.25-1.48)	2.55(0.89-7.28)	1.11(0.11-11.39)	2.71(0.62-11.82)

¹ Lisboa = Lisboa e vale de Tejo

Significant OR are underlined for ease of interpretation

Table 7: Logistic regression (OR and 95% CI) with reported frequency of daily vegetable intake as dependent variable and demographic, personal, social environmental, and physical environmental factors per region: The Portuguese Pro Children Study

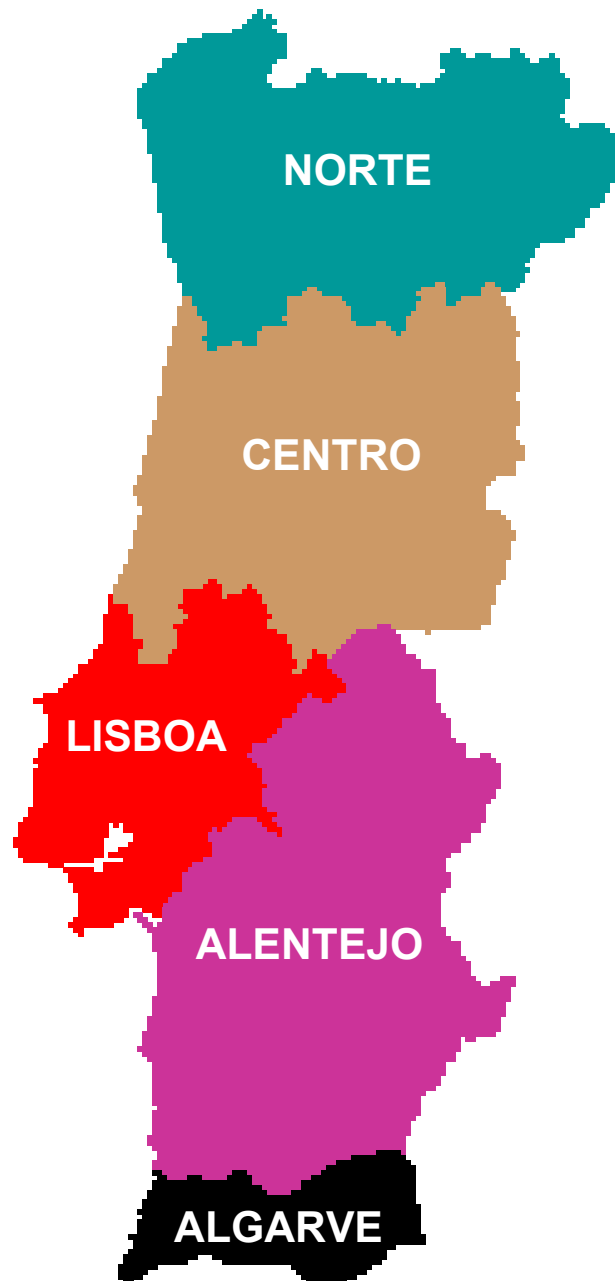
Vegetables Variables	Total sample		Regions				
	Girls (n=945)	Boys (n=836)	Norte (n=682)	Centro (n=379)	Lisboa ¹ (n=426)	Alentejo (n=144)	Algarve (n=150)
Region							
Norte	1(ref)	1(ref)					
Centro	1.44(0.99-2.11)	1.12(0.75-1.68)					
Lisboa ¹	0.95(0.65-1.37)	0.81(0.55-1.18)					
Alentejo	0.93(0.55-1.57)	1.06(0.58-1.93)					
Algarve	0.64(0.37-1.09)	0.68(0.38-1.22)					
Gender							
Girls			1(ref)	1(ref)	1(ref)	1(ref)	1(ref)
Boys			<u>0.63</u> (0.45-0.88)	<u>0.48</u> (0.31-0.76)	<u>0.55</u> (0.36-0.84)	0.75(0.336-1.58)	0.81(0.40-1.65)
Age							
11 years	1(ref)	1(ref)	1(ref)	1(ref)	1(ref)	1(ref)	1(ref)
> 11 years	0.90(0.68-1.21)	0.99(0.73-1.33)	0.87(0.61-1.23)	0.89(0.56-1.40)	1.10(0.71-1.69)	1.09(0.53-2.26)	1.08(0.53-2.20)
Personal factors							
Knowledge	<u>1.56</u> (1.16-2.09)	<u>1.97</u> (1.45-2.67)	<u>1.87</u> (1.32-2.64)	1.63(1.00-2.67)	<u>2.15</u> (1.40-3.31)	1.21(0.57-2.55)	1.23(0.59-2.55)
Liking	<u>2.28</u> (1.66-3.14)	<u>2.00</u> (1.41-2.83)	<u>2.49</u> (1.71-3.64)	<u>2.07</u> (1.26-3.41)	<u>2.15</u> (1.31-3.54)	1.66(0.67-4.17)	1.71(0.73-3.97)
Preferences	<u>1.40</u> (1.05-1.88)	<u>1.96</u> (1.43-2.68)	<u>1.57</u> (1.11-2.21)	<u>1.93</u> (1.21-3.09)	1.49(0.95-2.34)	1.25(0.59-2.65)	<u>2.14</u> (1.00-4.58)
Perceived social- Environmental factors							
Modelling	<u>1.70</u> (1.19-2.42)	<u>1.52</u> (1.05-2.20)	<u>1.72</u> (1.12-2.64)	<u>2.26</u> (1.26-4.07)	<u>1.68</u> (1.02-2.75)	1.53(0.58-4.00)	0.68(0.28-1.66)
Active parental encouragement	0.97(0.64-1.47)	1.03(0.70-1.53)	1.25(0.81-1.93)	0.71(0.35-1.45)	0.88(0.49-1.58)	1.19(0.40-3.57)	0.63(0.23-1.77)
Demand family rule	1.18(0.80-1.76)	<u>1.61</u> (1.09-2.36)	1.41(0.93-2.14)	1.48(0.74-2.94)	1.77(0.98-3.20)	1.10(0.42-2.89)	1.03(0.38-2.79)
Parental facilitation	<u>1.45</u> (1.07-1.97)	1.02(0.74-1.40)	1.17(0.82-1.66)	1.19(0.71-1.98)	1.21(0.77-1.90)	1.55(0.73-3.28)	1.44(0.65-3.22)
Perceived physical- Environmental factors							
Availability at home	<u>1.61</u> (1.07-2.44)	0.95(0.61-1.48)	1.16(0.71-1.90)	1.43(0.71-2.88)	1.16(0.61-2.21)	1.62(0.51-5.16)	1.56(0.61-3.95)

¹ Lisboa = Lisboa e vale de Tejo

Significant OR are underlined for ease of interpretation

Appendix 2

PORTUGUESE REGIONS



Appendix 3



Kostvaner hos skolebarn

Elevskjema

Skole:

Klasse:

ID:



Kjære skoleelev

Vi ber deg om å hjelpe oss med et prosjekt om skolebarns matvaner. Denne undersøkelsen blir gjennomført i ni europeiske land, og mer enn 14 000 skolebarn deltar i den.

Vi ber deg om å svare på spørreskjemaet. Ikke skriv navnet ditt på skjemaet!

Når du har svart på hele spørreskjemaet legger du det i konvolutten, lukker igjen konvolutten og leverer den til læreren din. Alle svarene du gir er hemmelige. Ingen på skolen din, eller andre som du kjenner, får vite hva du har svart.

Det er frivillig å være med i denne undersøkelsen. Hvis du ikke vil svare på spørreskjemaet, legger du det ubesvart tilbake i konvolutten.

Tusen takk for hjelpen!

Professor Knut-Inge Klepp
Institutt for Ernæringsforskning
Universitetet i Oslo

Hvordan fylle ut spørreskjemaet

De fleste spørsmålene svares ved å krysse av for ditt svar i en boks. I noen spørsmål ber vi deg om å skrive ned svaret ditt.

Et eksempel:

Tror du at du spiser mye eller lite frokostblanding?

- ☐ Veldig mye frokostblanding
- ☒ Mye frokostblanding
- ☐ Verken mye eller lite
- ☐ Lite frokostblanding
- ☐ Veldig lite frokostblanding



Noen spørsmål om deg selv

D1. Hvilket år er du født?

19_____

D2. I hvilken måned har du fødselsdag?

- ☐ Januar
- ☐ Februar
- ☐ Mars
- ☐ April
- ☐ Mai
- ☐ Juni
- ☐ Juli
- ☐ August
- ☐ September
- ☐ Oktober
- ☐ November
- ☐ Desember

D3. Er du jente eller gutt?

- ☐ Jente
- ☐ Gutt

D4. Er du født i Norge?

- ☐ Ja
- ☐ Nei

D5. I hvilket land er moren din født?

D6. I hvilket land er faren din født?

D7. Hvilket språk snakker dere vanligvis hjemme?

D8. Bor du sammen med begge foreldrene dine?

(Hvis du bor to steder, kan du krysse av i to bokser)

- ☐ Bare med moren min
- ☐ Bare med faren min
- ☐ Med moren min og hennes nye mann/samboer
- ☐ Med faren min og hans nye kone/samboer
- ☐ Både med moren min og faren min hele tiden
- ☐ Andre voksne? Skriv hvem:

D9. Hvor mange brødre og søstre har du?

_____bror/brødre

_____søster/søstre



Noen spørsmål om hva du spiste I GÅR

I går morges, før skoletid

H1. Hvilken dag var det i går?

- ☐ Søndag
☐ Mandag
☐ Tirsdag
☐ Onsdag
☐ Torsdag

H2. Når sto du opp?

H3. Spiste eller drakk du noe i går
morges før skoletid?

- ☐ Ja
☐ Nei

Hva var det? (skriv bare stikkord som
brød, melk, cornflakes osv)

**De neste spørsmålene er om juice,
frukt og grønnsaker**

H4. Drakk du juice i går morges før
skoletid?

- ☐ Ja
☐ Nei

Hvis ja,

Hva slags juice? Hvor mye?

*Skriv 1 hvis du drakk ett glass, 1/2 hvis
du drakk et halvt glass*

Appelsinjuice		glass
Annen fruktjuice		glass

H5. Spiste du frukt i går morges før
skoletid?

- ☐ Ja
☐ Nei

Hvis ja,

Hva slags frukt? Hvor mye?

*Skriv 1 hvis du spiste ett eple, 1/2 hvis
du spiste et halvt*

Eple		stykk
Banan		stykk
Appelsin		stykk
Klementin		stykk
Pære		stykk
Melon		skive
Fruktsalat		porsjon
Annen frukt (skriv hva) _____		stykk eller porsjon

H6. Spiste du rå grønnsaker i går morges før skoletid?

☐ Ja

☐ Nei

Hvis ja,

Hva slags grønnsaker? Hvor mye?

Skriv 1 hvis du spiste en tomat, 1/2 hvis du spiste en halv

Tomat		stykk
Agurk bit		stykk
Gulrot		stykk
Andre rå grønnsaker (skriv hva)		stykk

I går i løpet av
skoledagen

H7. Spiste eller drakk du noe i løpet av skoledagen i går?

☐ Ja

☐ Nei

Hva var det? (skriv bare stikkord som matpakke, yoghurt, melk osv)

De neste spørsmålene er om juice, frukt og grønnsaker

H8. Drakk du juice i løpet av skoledagen i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags juice? Hvor mye?

Skriv 1 hvis du drakk ett glass, 1/2 hvis du drakk et halvt glass

Appelsinjuice		glass
Annen fruktjuice		glass

H9. Spiste du frukt i løpet av skoledagen i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags frukt? Hvor mye?

Skriv 1 hvis du spiste ett eple, 1/2 hvis du spiste et halvt

Eple		stykk
Banan		stykk
Appelsin		stykk
Klementin		stykk
Pære		stykk
Melon		skive
Fruktsalat		porsjon
Annen frukt (skriv hva)		stykk eller porsjon

H10. Spiste du salat i løpet av skoledagen i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags salat? Hvor mye?

*Skriv 1 hvis du spiste en porsjon, 1/2
hvis du spiste en halv porsjon*

Blandet salat		porsjon
Grønn salat		porsjon
Tomatsalat		porsjon
Agurksalat		porsjon
Revne grønnsaker		porsjon
Annen salat (skriv hva)		porsjon
_____		porsjon

H11. Spiste du andre rå grønnsaker i løpet av skoledagen i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags grønnsaker? Hvor mye?

*Skriv 1 hvis du spiste en tomat, 1/2
hvis du spiste en halv*

Tomat		stykk
Agurk bit		stykk
Gulrot		stykk
Andre rå grønnsaker (skriv hva)		stykk
_____		stykk

H12. Spiste du varme grønnsaker i løpet av skoledagen i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags grønnsaker? Hvor mye?

*Skriv 1 hvis du spiste en porsjon, 1/2
hvis du spiste en halv porsjon*

Blandete grønnsaker		porsjon
Grønne erter		porsjon
Mais		porsjon
Grønne bønner		porsjon
Blomkål		porsjon
Brokkoli		porsjon
Andre varme grønnsaker (skriv hva)		porsjon
_____		porsjon

H13. Spiste du grønnsakssuppe i løpet av skoledagen i går?

☐ Ja

☐ Nei

Hvis ja,

Hvor mye?

*Skriv 1 hvis du spiste en porsjon, 1/2
hvis du spiste en halv porsjon*

Hvor mye?		porsjon
-----------	--	---------



I går etter skolen og fram til du la deg

H14. Spiste eller drakk du noe i går etter skoletid, men før middag?

☐ Ja

☐ Nei

Hva var det?

(skriv bare stikkord som brødskeive, yoghurt osv)

H15. Hva spiste du til middag i går?

(skriv bare stikkord)

H16. Hva spiste du til kvelds i går?

(skriv bare stikkord)

De neste spørsmålene er om juice, frukt og grønnsaker

H17. Drakk du juice i perioden etter skoletid og fram til du la deg i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags juice? Hvor mye?

Skriv 1 hvis du drakk ett glass, 1/2 hvis du drakk et halvt glass

Appelsinjuice		glass
Annen fruktjuice		glass

H18. Spiste du frukt i perioden etter skoletid og fram til du la deg i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags frukt? Hvor mye?

Skriv 1 hvis du spiste ett eple, 1/2 hvis du spiste et halvt

Eple		stykk
Banan		stykk
Appelsin		stykk
Klementin		stykk
Pære		stykk
Melon		skive
Fruktsalat		porsjon
Annen frukt (skriv hva)		stykk eller porsjon

H19. Spiste du salat i perioden etter skoletid og fram til du la deg i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags salat? Hvor mye?

Skriv 1 hvis du spiste en porsjon, 1/2 hvis du spiste en halv porsjon

Blandet salat		porsjon
Grønn salat		porsjon
Tomatsalat		porsjon
Agurksalat		porsjon
Revne grønnsaker		porsjon
Annen salat (skriv hva)		porsjon
_____		porsjon

H20. Spiste du andre rå grønnsaker i perioden etter skoletid og fram til du la deg i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags grønnsaker? Hvor mye?

Skriv 1 hvis du spiste en tomat, 1/2 hvis du spiste en halv

Tomat		stykk
Agurk bit		stykk
Gulrot		stykk
Andre rå grønnsaker (skriv hva)		stykk
_____		stykk

H21. Spiste du varme grønnsaker i perioden etter skoletid og fram til du la deg i går?

☐ Ja

☐ Nei

Hvis ja,

Hva slags grønnsaker? Hvor mye?

Skriv 1 hvis du spiste en porsjon, 1/2 hvis du spiste en halv porsjon

Blandete grønnsaker		porsjon
Grønne erter		porsjon
Mais		porsjon
Grønne bønner		porsjon
Blomkål		porsjon
Brokkoli		porsjon
Andre varme grønnsaker (skriv hva)		porsjon
_____		porsjon

H22. Spiste du grønnsakssuppe i perioden etter skoletid og fram til du la deg i går?

☐ Ja

☐ Nei

Hvis ja,

Hvor mye?

Skriv 1 hvis du spiste en porsjon, 1/2 hvis du spiste en halv porsjon

Hvor mye?		porsjon
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Hva spiser du vanligvis?

(Sett bare ett kryss for hvert spørsmål)

F1. Hvor ofte spiser du vanligvis frisk frukt?

- ☐ Aldri
- ☐ Mindre enn 1 dag i uka
- ☐ 1 dag i uka
- ☐ 2-4 dager i uka
- ☐ 5-6 dager i uka
- ☐ Hver dag, en gang om dagen
- ☐ Hver dag, to ganger om dagen
- ☐ Hver dag, mer enn to ganger om dagen

F2. Hvor ofte spiser du vanligvis salat eller revne grønnsaker?

- ☐ Aldri
- ☐ Mindre enn 1 dag i uka
- ☐ 1 dag i uka
- ☐ 2-4 dager i uka
- ☐ 5-6 dager i uka
- ☐ Hver dag, en gang om dagen
- ☐ Hver dag, to ganger om dagen
- ☐ Hver dag, mer enn to ganger om dagen

F3. Hvor ofte spiser du vanligvis andre rå grønnsaker?

- ☐ Aldri
- ☐ Mindre enn 1 dag i uka
- ☐ 1 dag i uka
- ☐ 2-4 dager i uka
- ☐ 5-6 dager i uka
- ☐ Hver dag, en gang om dagen
- ☐ Hver dag, to ganger om dagen
- ☐ Hver dag, mer enn to ganger om dagen

F4. Hvor ofte spiser du vanligvis poteter?

- ☐ Aldri
- ☐ Mindre enn 1 dag i uka
- ☐ 1 dag i uka
- ☐ 2-4 dager i uka
- ☐ 5-6 dager i uka
- ☐ Hver dag, en gang om dagen
- ☐ Hver dag, to ganger om dagen
- ☐ Hver dag, mer enn to ganger om dagen

F5. Hvor ofte spiser du vanligvis varme grønnsaker?

- ☐ Aldri
- ☐ Mindre enn 1 dag i uka
- ☐ 1 dag i uka
- ☐ 2-4 dager i uka
- ☐ 5-6 dager i uka
- ☐ Hver dag, en gang om dagen
- ☐ Hver dag, to ganger om dagen
- ☐ Hver dag, mer enn to ganger om dagen

F6. Hvor ofte drikker du vanligvis ren fruktjuice?

- ☐ Aldri
- ☐ Mindre enn 1 dag i uka
- ☐ 1 dag i uka
- ☐ 2-4 dager i uka
- ☐ 5-6 dager i uka
- ☐ Hver dag, en gang om dagen
- ☐ Hver dag, to ganger om dagen
- ☐ Hver dag, mer enn to ganger om dagen



Noen spørsmål om hva foreldrene dine gjør

(Sett bare ett kryss for hvert spørsmål)

D10. Har moren din en jobb?

- ☐ Ja
- ☐ Nei
- ☐ Vet ikke
- ☐ Jeg har ingen mor/har ikke kontakt med moren min

D10b. Hvis ja, skriv hvor hun arbeider
(for eksempel skole, restaurant, sykehus, bank)

D10c. Skriv hva slags jobb hun har der (for eksempel lærer, kokk, sykepleier, regnskapsfører/revisor)

D11. Har faren din en jobb?

- ☐ Ja
- ☐ Nei
- ☐ Vet ikke
- ☐ Jeg har ingen far/har ikke kontakt med faren min

D11b. Hvis ja, skriv hvor han arbeider
(for eksempel skole, restaurant, sykehus, bank)

D11c. Skriv hva slags jobb han har der (for eksempel lærer, kokk, sykepleier, regnskapsfører/revisor)



Nå noen spørsmål om frukt

(Sett bare ett kryss for hvert spørsmål)

D12. Tror du at du spiser mye eller lite frukt?

- ☐ Veldig mye frukt
- ☐ Mye frukt
- ☐ Verken mye eller lite frukt
- ☐ Lite frukt
- ☐ Veldig lite frukt

D13. Tror du at du spiser mer eller mindre frukt enn flesteparten av guttene og jentene på din alder?

- ☐ Mye mer
- ☐ Litt mer
- ☐ Like mye
- ☐ Litt mindre
- ☐ Mye mindre

D14. Hvor mye frukt tror du at du bør spise for å ha et sunt kosthold?

- ☐ Ingen frukt
- ☐ 1-3 frukter i uka
- ☐ 4-6 frukter i uka
- ☐ 1 frukt om dagen
- ☐ 2 frukter om dagen
- ☐ 3 frukter om dagen
- ☐ 4 frukter om dagen
- ☐ 5 frukter om dagen eller mer

Hvor enig er du i de forskjellige utsagnene?

D15. Å spise frukt hver dag gjør at jeg kjenner meg opplagt

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

Hvor enig er du i de forskjellige utsagnene?

D16. Å spise frukt hver dag gir meg mer energi

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D17. Jeg liker å spise frukt hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D18. Frukt smaker godt

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D19. Moren min spiser frukt hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig
- ☐ Jeg har ingen mor/har ikke kontakt med moren min



Spørsmål om frukt fortsetter

(Sett bare ett kryss for hvert spørsmål)

Hvor enig er du i de forskjellige utsagnene?

D20. Faren min spiser frukt hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig
- ☐ Jeg har ingen far/har ikke kontakt med faren min

D21. Mine beste venner spiser frukt hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D22. Moren min oppmuntrer meg til å spise frukt hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig
- ☐ Jeg har ingen mor/har ikke kontakt med moren min

D23. Faren min oppmuntrer meg til å spise frukt hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig
- ☐ Jeg har ingen far/har ikke kontakt med faren min

Hvor enig er du i de forskjellige utsagnene?

D24. Det er vanskelig for meg å spise frukt hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D25. Jeg kan spise frukt hver dag om jeg bestemmer meg for det

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D26. Jeg ønsker å spise frukt hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D27. Å spise frukt hver dag er en vane for meg

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig



Spørsmål om frukt fortsetter

D28. Hvilke av de følgende fruktene liker du eller liker du ikke:
(Sett bare ett kryss for hver linje!)

	Liker veldig godt	Liker litt	Misliker litt	Misliker veldig sterkt	Har ikke smakt
Epler	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bananer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pærer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appelsiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Klementiner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plommer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fersken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Melon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jordbær	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Druer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kirsebær	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kiwi	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Noen spørsmål om frukt hjemme

(Om du bytter på å bo to steder, svarer du for det stedet der du bor mesteparten av tiden)

D29. Bestemmer foreldrene dine at du skal spise frukt hver dag?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D30. Kan du spise så mye frukt som du vil hjemme?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

Noen spørsmål om frukt hjemme

(Om du bytter på å bo to steder, svarer du for det stedet der du bor mesteparten av tiden)

D31. Kan du drikke så mye fruktjuice som du vil hjemme?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D32. Hvis du forteller hjemme hva slags frukt du ville likt å spise, vil den bli kjøpt inn?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D33. Hvis du sier hjemme hva slags fruktjuice du ville likt å drikke, vil den bli kjøpt inn?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D34. Er det vanligvis ulike sorter frukt tilgjengelig hjemme hos deg?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D35. Er det vanligvis frukt som du liker tilgjengelig hjemme hos deg?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D36. Er det vanligvis fruktjuice som du liker tilgjengelig hjemme hos deg?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D37. Pleier moren eller faren din vanligvis å kutte opp frukt til deg mellom måltidene?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

Noen spørsmål om frukt på skolen og om fritidsaktivitetene dine

D38. Har du vanligvis med deg frukt på skolen?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D39. Kan du få tak i frukt på skolen, enten ved å kjøpe det, eller at du får det gratis?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D40. Kan du få frukt hjemme hos vennene dine, når du er der etter skoletid?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D41. Kan du få tak i frukt på de stedene der du driver med fritidsaktivitetene dine (for eksempel på en klubb, på trening) enten ved å kjøpe det, eller at du får det gratis?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri
- ☐ Jeg deltar ikke i noen fritidsaktiviteter

D42. Hvor enig er du i de forskjellige utsagnene?

(Sett bare ett kryss for hver linje!)

	Helt enig	Litt enig	Verken enig eller uenig	Litt uenig	Helt uenig
Jeg spiser ikke frukt fordi det tar for lang tid å spise det	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg spiser ikke frukt fordi jeg heller har lyst på noe annet (f.eks. godteri)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg spiser ikke frukt fordi fingrene mine blir klissete når jeg gjør det	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg spiser ikke frukt fordi den blir klemt i skolesekken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Nå noen spørsmål om grønnsaker

(Sett bare ett kryss for hvert spørsmål)

D43. Tror du at du spiser mye eller lite grønnsaker?

- ☐ Veldig mye grønnsaker
- ☐ Mye grønnsaker
- ☐ Verken mye eller lite grønnsaker
- ☐ Lite grønnsaker
- ☐ Veldig lite grønnsaker

D44. Tror du at du spiser mer eller mindre grønnsaker enn flesteparten av guttene og jentene på din alder?

- ☐ Mye mer
- ☐ Litt mer
- ☐ Like mye
- ☐ Litt mindre
- ☐ Mye mindre

D45. Hvor mye grønnsaker tror du at du bør spise for å ha et sunt kosthold?

- ☐ Ingen grønnsaker
- ☐ 1-3 porsjoner i uka
- ☐ 4-6 porsjoner i uka
- ☐ 1 porsjon om dagen
- ☐ 2 porsjoner om dagen
- ☐ 3 porsjoner om dagen
- ☐ 4 porsjoner om dagen
- ☐ 5 eller flere porsjoner om dagen

Hvor enig er du i de forskjellige utsagnene?

D46. Å spise grønnsaker hver dag gjør at jeg kjenner meg opplagt

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D47. Å spise grønnsaker hver dag gir meg mer energi

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D48. Jeg liker å spise grønnsaker hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D49. Grønnsaker smaker godt

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D50. Moren min spiser grønnsaker hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig
- ☐ Jeg har ingen mor/har ikke kontakt med moren min

D51. Faren min spiser grønnsaker hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig
- ☐ Jeg har ingen far/har ikke kontakt med faren min



Spørsmål om grønnsaker fortsetter

(Sett bare ett kryss for hvert spørsmål)

Hvor enig er du i de forskjellige utsagnene?

D52. Mine beste venner spiser grønnsaker hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D53. Moren min oppmuntrer meg til å spise grønnsaker hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig
- ☐ Jeg har ingen mor/har ikke kontakt med moren min

D54. Faren min oppmuntrer meg til å spise grønnsaker hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig
- ☐ Jeg har ingen far/har ikke kontakt med faren min

Hvor enig er du i de forskjellige utsagnene?

D55. Jeg spiser ofte grønnsaker sammen med familien min

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D56. Det er vanskelig for meg å spise grønnsaker hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D57. Jeg kan spise grønnsaker hver dag om jeg bestemmer meg for det

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig

D58. Jeg ønsker å spise grønnsaker hver dag

- ☐ Helt enig
- ☐ Litt enig
- ☐ Verken enig eller uenig
- ☐ Litt uenig
- ☐ Helt uenig



Spørsmål om grønnsaker fortsetter

(Sett bare ett kryss for hvert spørsmål)

Hvor enig er du i de forskjellige utsagnene?

D59. Å spise grønnsaker hver dag er en vane for meg

- ☐ Helt enig
☐ Litt enig
☐ Verken enig eller uenig
☐ Litt uenig
☐ Helt uenig

D60. Hvilke av de følgende grønnsakene liker du eller liker du ikke:

(Sett bare ett kryss for hver linje!)

	Liker veldig godt	Liker litt	Misliker litt	Misliker veldig sterkt	Har ikke smakt
Tomater	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Agurk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Salat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hodekål	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spinat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Purre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grønne bønner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Løk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gulrot	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Brokkoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blomkål	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grønne erter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Noen spørsmål om grønnsaker hjemme

(Om du bytter på å bo to steder, svarer du for det stedet der du bor mesteparten av tiden)

D61. Bestemmer foreldrene dine at du skal spise grønnsaker hver dag?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D62. Kan du spise så mye grønnsaker som du vil hjemme?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D63. Hvis du forteller hjemme hvilke grønnsaker du ville likt å spise, vil de bli kjøpt inn?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D64. Er det vanligvis ulike sorter grønnsaker tilgjengelig hjemme hos deg?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D65. Er det vanligvis grønnsaker som du liker tilgjengelig hjemme hos deg?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D66. Pleier moren eller faren din vanligvis å kutte opp grønnsaker til deg mellom måltidene?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D67. Har du vanligvis med deg grønnsaker på skolen?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D68. Kan du få tak i grønnsaker på skolen, enten ved å kjøpe det, eller at du får det gratis?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri



Noen spørsmål om grønnsaker på skolen og om fritidsaktivitetene dine

D69. Kan du få grønnsaker hjemme hos vennene dine, når du er der etter skoletid?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri

D70. Kan du få tak i grønnsaker på de stedene der du driver med fritidsaktivitetene dine (for eksempel på en klubb, på trening) enten ved å kjøpe det, eller at du får det gratis?

- ☐ Ja, alltid
- ☐ Ja, de fleste dager
- ☐ Av og til
- ☐ Sjelden
- ☐ Aldri
- ☐ Jeg deltar ikke i noen fritidsaktiviteter

D71. Hvor enig er du i de forskjellige utsagnene?

(Sett bare ett kryss for hver linje!)

	Helt enig	Litt enig	Verken enig eller uenig	Litt uenig	Helt uenig
Jeg spiser ikke grønnsaker fordi det tar for lang tid å spise dem	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg spiser ikke grønnsaker fordi jeg fortsatt er sulten etter å ha spist dem	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg spiser ikke grønnsaker fordi jeg heller har lyst på noe annet (f.eks. godteri)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg spiser ikke grønnsaker fordi de blir klemt i skolesekken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Noen spørsmål om måltider

(Om du bytter på å bo to steder, svarer du for det stedet der du bor mesteparten av tiden)

D72. Hvor ofte spiser du frokost sammen med moren din og/eller faren din?

- ☐ Hver dag
- ☐ 4-6 dager i uka
- ☐ 1-3 dager i uka
- ☐ Sjeldnere enn 1 dag i uka
- ☐ Aldri

D73. Hvor ofte spiser du middag sammen med moren din og/eller faren din?

- ☐ Hver dag
- ☐ 4-6 dager i uka
- ☐ 1-3 dager i uka
- ☐ Sjeldnere enn 1 dag i uka
- ☐ Aldri

Noen spørsmål om TV-titting og reklame

D74. I løpet av den siste måneden, har du sett noen tv-reklamer om:
(Sett bare ett kryss for hver linje!)

	Ja	Nei
Godteri/smågodt/sjokolade	<input type="checkbox"/>	<input type="checkbox"/>
Søte kjeks, boller, kaker	<input type="checkbox"/>	<input type="checkbox"/>
Frisk frukt	<input type="checkbox"/>	<input type="checkbox"/>
Vann	<input type="checkbox"/>	<input type="checkbox"/>
Brus	<input type="checkbox"/>	<input type="checkbox"/>
Grønnsaker	<input type="checkbox"/>	<input type="checkbox"/>
Potetgull og annen salt snacks	<input type="checkbox"/>	<input type="checkbox"/>
Fast food (f.eks. hamburgere, pølser, pommes frites)	<input type="checkbox"/>	<input type="checkbox"/>
Fruktjuice	<input type="checkbox"/>	<input type="checkbox"/>

Spørsmål om TV-titting og reklame fortsetter

D75. Hvor ofte står TV på under middagen hjemme hos deg?

- ☐ Hver dag
- ☐ 4-6 dager i uka
- ☐ 1-3 dager i uka
- ☐ Sjeldnere enn 1 dag i uka
- ☐ Aldri

D76. Hvor mange timer om dagen ser du vanligvis på TV og video i fritiden din?

- ☐ Ingen
- ☐ Omtrent en halv time om dagen
- ☐ Omtrent 1 time om dagen
- ☐ Omtrent 2 timer om dagen
- ☐ Omtrent 3 timer om dagen
- ☐ Omtrent 4 timer om dagen
- ☐ Omtrent 5 timer om dagen
- ☐ Omtrent 6 timer om dagen
- ☐ Omtrent 7 timer om dagen eller mer

Noen spørsmål om andre ting du kanskje gjør i fritiden din

(Sett bare ett kryss for hvert spørsmål)

D77. UTENFOR SKOLETIDEN: Hvor mange TIMER i uka trener du vanligvis i fritiden din slik at du blir andpusten eller svett?

- ☐ Ingen
- ☐ Omtrent en halv time i uka
- ☐ Omtrent 1 time i uka
- ☐ Omtrent 2 til 3 timer i uka
- ☐ Omtrent 4 til 6 timer i uka
- ☐ 7 timer i uka eller mer

D78. Hvor mange timer om dagen bruker du datamaskin (for å spille, sende e-post, chatte eller surfe på internett) i fritiden din?

- ☐ Ingen
- ☐ Omtrent en halv time om dagen
- ☐ Omtrent 1 time om dagen
- ☐ Omtrent 2 timer om dagen
- ☐ Omtrent 3 timer om dagen
- ☐ Omtrent 4 timer om dagen
- ☐ Omtrent 5 timer om dagen
- ☐ Omtrent 6 timer om dagen
- ☐ Omtrent 7 timer om dagen eller mer

Til slutt noen spørsmål om frukt og grønnsaker

D79. Hvor enig er du i de forskjellige utsagnene om frukt?
(Sett bare ett kryss for hver linje!)

	Helt enig	Litt enig	Verken enig eller uenig	Litt uenig	Helt uenig
Friminuttene er ikke lange nok til å spise frukt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Klassekameratene mine spiser mye frukt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mesteparten av frukten ser fersk/fin ut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg er fortsatt sulten etter å ha spist frukt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg er allergisk mot frukt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D80. Hvor enig er du i de forskjellige utsagnene om grønnsaker?
(Sett bare ett kryss for hver linje!)

	Helt enig	Litt enig	Verken enig eller uenig	Litt uenig	Helt uenig
Friminuttene er ikke lange nok til å spise grønnsaker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Klassekameratene mine spiser mye grønnsaker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mesteparten av grønnsakene ser ferske/fine ut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fingrene mine blir klissete når jeg spiser grønnsaker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg er allergisk mot grønnsaker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tusen takk for hjelpen!

Vær snill å putte spørreskjemaet i konvolutten, lukk den igjen og gi den til læreren din.

Om du har litt tid igjen før friminuttet, kan du lage en frukt og grønnsakstegning her:

